Medical Library

SERIES 3, Vol. 24, No. 2 FEBRUARY, 1941

FEB 10 1941

AMERICAN JOURNAL OF OPHTHALMOLOGY

CONTENTS

		PAGE
Surgical treatment of syphilitic optic atrophy	*L. Hausman*	119
Pseudomelanomas of the iris	*B. A. Klien*	133
Keratoplasty. Part II	*R. Castroviejo*	139
The screen test and its modifications	*J. W. White*	156
Corneal ulcer with lymphogranuloma venereum	*G. P. Meyer and J. Reber*	161
Pseudoglioma of the retina	*J. O. Wetzel*	164
Sulfonamide therapy of trachoma	*J. E. Smith, L. A. Julianelle, and J. H. Gamet*	174
Congenital colobomata of the lower lid	*E. B. Spaeth*	186
Lipid and cholesterol content of lenses	*P. W. Salit*	191
Annular scotoma	*A. Callahan*	196

DEPARTMENTS

Society Proceedings	200
Editorials	207
Book Notices	211
Obituary	212
Correspondence	214
Abstracts	215
News Items	245

For complete table of contents see advertising page V

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Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve Dollars. Published monthly by the George Banta Publishing Company, 450 Ahnaip Street, Menasha, Wisconsin, for the Ophthalmic Publishing Company. Subscription and Editorial Office: 837 Carew Tower, Cincinnati, Ohio. Entered as second class matter at the post office at Menasha, Wisconsin.

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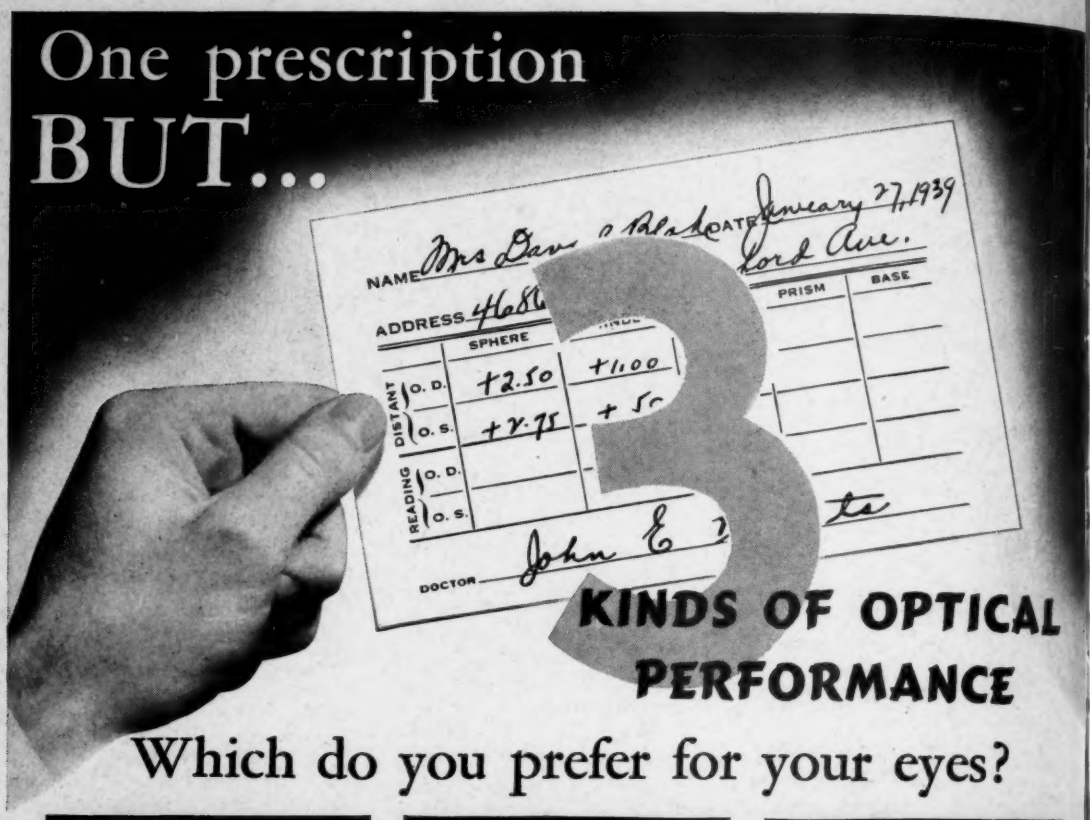

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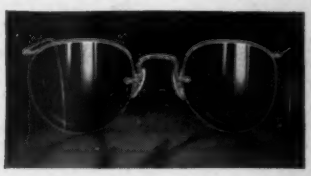

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 24 FEBRUARY, 1941 NUMBER 2

THE SURGICAL TREATMENT OF SYPHILITIC OPTIC ATROPHY DUE TO CHIASMAL ARACHNOIDITIS*

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New York

The syndrome of failing vision and primary optic atrophy due to syphilitic arachnoiditis of the optic chiasm and nerves was reported[1] in 1937. Although the study of this condition was begun in 1932, the diagnosis of syphilitic chiasmal arachnoiditis could not be established with certainty at that time because the patients under observation did not submit to operation. It was not until 1936, when a craniotomy was performed on the patient later described as case 1 in the report of 1937, that this pathological entity could be verified on the operating table. The optic chiasm and nerves were exposed and found to be enveloped by dense adhesions, which were freed by blunt dissection. Soon thereafter vision began to return. However, since the period of postoperative observation in this case was only four weeks when it was first reported, the evaluation of the degree and permanence of visual improvement was deferred. Now, two years after the operation, this appraisal can be made. The present report includes the follow-up notes on this patient observed over a period of two years, together with an account of the management and results obtained in two additional cases (cases 6 and 7) in which operation was performed for the same condition and likewise revealed adhesions around the optic chiasm. In all, six cases with this syndrome were observed between 1932 and 1938, but only three patients (cases 1, 6, and 7) consented to operation. It is this group which is herein reported.

*From the Neurological Service, Cornell Division, The Bellevue Hospital. Read before the American Neurological Association, June 7, 1939.

REPORT OF CASES

FOLLOW-UP OF CASE 1

R.B., a negress aged 26 years, was admitted on October 16, 1936, with the complaints of anosmia and progressive loss of vision for two years. On examination there was bilateral anosmia. The left eye was blind, except for a small sector mapped with a 40-mm. white test object in the lower nasal quadrant. In the right eye there was a temporal hemianopsia (fig. 1). Visual acuity in the left eye was light perception; in the right eye it was 20/100. Color perception was absent in both eyes. The fundi showed bilateral primary optic atrophy. The pupils were equal but slightly irregular; they reacted sluggishly to light but well on near fixation. The rest of the neurological examination was negative. The Wassermann reaction of the blood was 4 plus. Examination of the cerebrospinal fluid revealed 20 monocytes and a negative Wassermann reaction. A roentgenogram of the skull showed a small erosion in the right parietal region which suggested a syphilitic process. On October 26, 1936, a craniotomy, performed by Dr. A. Kap-

lan, revealed many adhesions between the dura and the frontal lobe, as well as a dense adhesive arachnoiditis around the optic chiasm and nerves. These adhesions were released by blunt dissection.

Postoperative course: The patient made a good recovery and showed immediate improvement in visual function. Two days after operation light appeared brighter in the left eye. Five days after operation the patient was able to see fingers with that eye. The progress made in the improvement of visual acuity is charted in table 1. This improvement continued steadily, so that two years after operation uncorrected visual acuity in the left eye was 16/15 and in the right eye 16/15—2. Color vision also returned in both eyes; the patient could recognize red and blue, but not green.

The recovery in visual function was reflected not only in the progress of the visual acuity but also in the expansion of the visual fields as recorded in figures 2 and 3. Figure 2 reveals definite expansion in the fields mapped 13 days after operation. Many fields for peripheral and central vision were charted at frequent intervals during the next two years. All showed definite progressive improvement. The last visual fields which were mapped 2 years and 10 days after operation showed not only no regression but even greater expansion in both eyes (fig. 3).

The patient, seven weeks after the operation, was put on antisyphilitic treatment, which was administered as follows, beginning in December, 1936: 20 weekly injections of bismuth 75 mg. until June 9, 1937; 10 weekly injections of neosalvarsan 0.45 gm. given until August, 1937. This was followed by 20 more weekly injections of bismuth until 1938. On February 14, 1938, the Kahn test was 1 plus. Treatment was continued, and the patient received eight weekly injections of neosalvarsan until May 5, 1938. On May 12, 1938, the Kahn test was 4 plus. On August 19, 1938, tests gave the following results: blood Wassermann, plus-minus; cerebrospinal fluid Wassermann, negative; 3 lymphocytes. Colloidal gold curve, 0011110000; protein, 40 mg. The patient received 12 weekly injections of

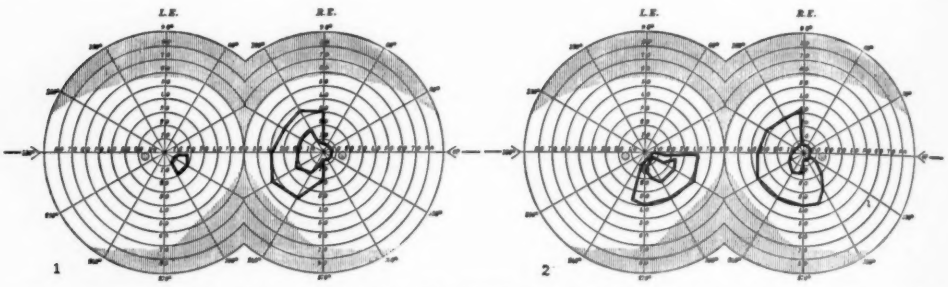

Fig. 1 (Hausman). Case 1 (October 13, 1936). Visual fields before operation. L.E.: Field mapped with a 40-mm. white test object at 2,000 mm.; smaller test object could not be seen. R.E.: Fields mapped with 5-mm. and 12-mm. white test objects at 2,000 mm. These fields point to a chiasmal lesion. Visual acuity; L.E., can detect only shadows and light in the blind field; R.E., 20/100 uncorrected.

Fig. 2 (Hausman). Case 1 (November 8, 1936). Thirteen days after operation. The visual fields and acuity have definitely improved in comparison with figure 1. L.E.: Visual fields mapped with 12-mm. and 40-mm. white test objects at 2,000 mm. Compared with figure 1, there is an increase in the size of the 40-mm. field; and 12-mm. field can now be charted. R.E.: Visual fields mapped with 3-mm. and 12-mm. white test objects. Compared with figure 1, the 12-mm. field shows expansion in the lower temporal quadrant. The 3-mm. field can now be charted for the first time. Visual acuity: L.E., counts fingers; R.E., 20/100—1 uncorrected.

bismuth until October 9, 1938, and 6 additional bismuth injections up to March 2, 1939. She did not attend the clinic steadily after January 11, 1939.

Comment: This case is of special interest at this time because of the long postoperative period of observation. Two years have elapsed since the operation, and the therapeutic result is excellent; the patient retains her maximum gain, both in the acuity of vision and the expansion of the visual fields. She is now working as a cook. However, despite this marked visual improvement, the bilateral primary optic atrophy has remained unchanged; the discs now are still as white as they were before operation.

Since the patient, seven weeks after the operation, was put on antisyphilitic treatment, the question might be raised whether the visual improvement was due to this treatment or to the operation. It is well to note, therefore, that visual acuity improved soon after the operation and that the visual fields (fig. 2) showed improvement long before antisyphilitic medication was started. Furthermore, on the day medication was begun, visual acuity in the left eye had already improved to 10/200, and in the right eye to 20/65.

CASE 6 (R. B.). IMPAIRMENT OF VISION IN LEFT EYE 11 YEARS; BLIND IN THAT EYE EIGHT YEARS. IMPAIRED VISION IN THE RIGHT EYE FIVE YEARS. BILATERAL PRIMARY OPTIC ATROPHY. ABSENT ANKLE JERKS. HISTORY OF SYPHILIS AND ANTILUETIC TREATMENT. CRANIOTOMY; CHIASMAL ADHESIONS AND MARKED ATROPHY OF THE LEFT OPTIC NERVE. IMPROVEMENT OF VISION IN RIGHT EYE AFTER LIBERATION OF ADHESIONS; LEFT EYE UNCHANGED.

Clinical history. Robert B., a negro, aged 44 years, was admitted to the neurological service on August 26, 1938. His complaints were pain in the abdomen and progressive loss of vision. About three weeks before admission the patient suddenly experienced a sharp sticking pain in the right costal margin. One week later the pain suddenly shifted to the left side and radiated down the arm; it persisted up to the time of admission.

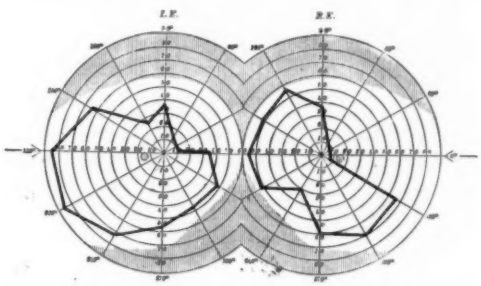

Fig. 3 (Hausman). Case 1 (November 5, 1938). Visual fields mapped 2 years and 10 days after operation with a 3-mm. white test object at 250 mm. for both eyes. Note marked expansion in visual fields, compared with figures 1 and 2. Visual acuity (uncorrected) in the left eye is 16/15; in the right eye (uncorrected) 16/15—2. Bilateral primary optic atrophy unchanged.

The loss of vision in both eyes was of long standing. The vision in the left eye

TABLE 1

PROGRESS OF VISUAL ACUITY IN CASE 1

Duration	Acuity L.	Acuity R.
10–13–36	Blind (P.L.*) No color vision	20/100 No color vision
10–26–36	Operation	
2 days	Light is brighter	
5 days	Sees fingers	
49 days	10/200	20/65
1 year	20/40−2	20/30−1
1¾ yr.	16/15	16/15−2
2 years	16/15 Return of color vision; red and blue	16/15−2 Return of color vision; red and blue

* P.L. = light perception.

became impaired in 1927, when the patient first experienced difficulty in reading the newspaper. Vision continued to fail rapidly, and in 1930 the left eye became completely blind. In 1933, vision in the right eye became impaired and diminished steadily for the next five years, up to the time of admission. Vision was so bad that the patient needed a constant escort and could not go about by himself.

There was a history of chancre about 18 years before admission, or 7 years before vision first became affected. The patient was seen in the syphilitic clinic of another institution in 1928. At that time the blood Wassermann was reported as follows: Cholesterin antigen 2 plus, alcoholic antigen negative, and Kahn precipitation 1.2. The patient received the following antisyphilitic treatment at this clinic from 1928 to 1932: 16 neosalvarsan, 32 silver salvarsan, and 54 bismuth injections. There was no improvement in vision after treatment. At that clinic his last blood Wassermann and several before were negative. The spinal fluid was not examined. The patient had an unknown eye condition in infancy while in the British West Indies and experienced a recurrence of this condition at the age of 17 while in Panama. There was no history of yaws. He had gonorrhea at the age of 24 years, for which he received treatment.

Physical examination. The left eye was blind, light perception being retained only in the upper temporal quadrant. In the right eye visual acuity was 2/200. Although the visual field in this eye, charted with a 5-mm. white test object at 250 mm., was only slightly constricted, the test object was not seen clearly in any part of the field (fig. 4). Vision throughout the field was greatly diminished. Color vision for red, blue, and green was lost. The fundi showed bilateral primary optic atrophy. The pupils were of moderate size and did not react to light or near objects. There was slight external strabismus of the left eye. Convergence was present only in the right eye. The knee jerks were active, the right more than the left. The ankle jerks could not be elicited. The superficial abdominal reflexes on the right side were diminished. Motility functions were normal. Gross smell tests were normal. The testes were insensitive to pressure. All forms of sensation, includ-

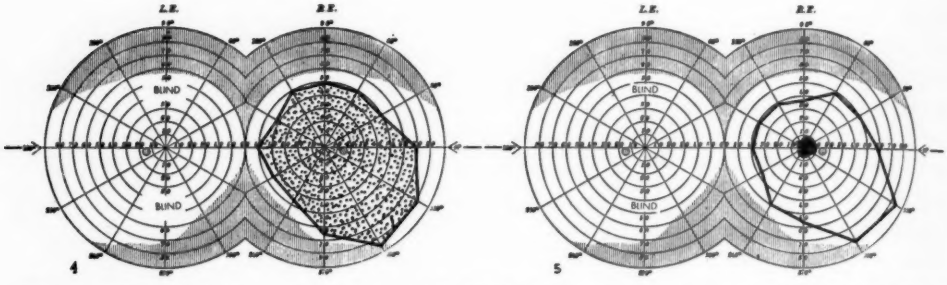

Fig. 4 (Hausman). Case 6 (September 8, 1938). Visual fields before operation. L.E.: Blind. R.E.: Mapped with 5-mm. white test object at 250 mm. The field is dotted to indicate that the test object was not clearly seen. Visual acuity: L.E., blind, light perception only in upper temporal quadrant; R.E., 2/200, loss of red, blue, and green.

Fig. 5 (Hausman). Case 6 (February 19, 1939). Visual fields 164 days after operation. L.E., unchanged; R.E., field mapped with 5-mm. white test object at 250 mm. Cross-checked area represents central scotoma. Compared with figure 4, the test object is seen more clearly in the remaining part of the field. Visual acuity: L.E., unchanged; R.E., 1/200.

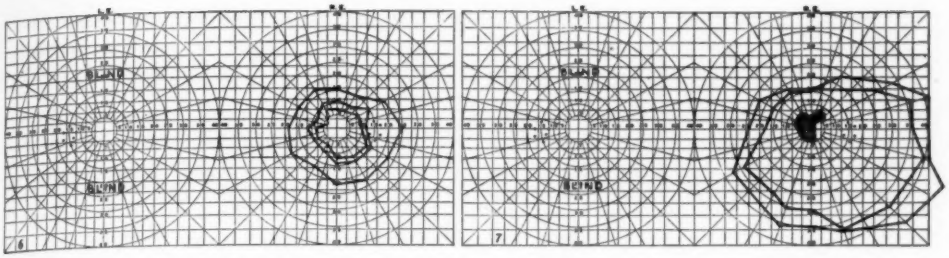

Fig. 6 (Hausman). Case 6 (November 13, 1938). Visual fields 66 days after operation, mapped on modified Bjerrum screen. L.E., blind; R.E., fields mapped with 5-, 12-, and 42-mm. white test objects at 1,000 mm. Central scotoma present but not charted. Visual acuity: L.E., unchanged; R.E., 3/200. Patient states that the letter "E" of the Snellen chart appears sharper and more distinct than it did before operation. Color vision has returned. Recognizes red and blue, but not green.

Fig. 7 (Hausman). Case 6 (February 19, 1939). Visual fields 164 days after operation, mapped on a modified Bjerrum screen. L.E., unchanged; R.E., fields mapped with 12- and 42-mm. white test objects at 1,000 mm. Cross-hatched area represents central scotoma for 12- and 42-mm. test objects. Fields, compared with those of figure 6, show improvement. Visual acuity: L.E., unchanged; R.E., 1/200. Reads "40" line of Snellen chart held in hand at 20 cm. in dim light.

ing vibratory and position sense in the lower extremities, were preserved.

On admission temperature was 100° F. Examination of the lungs was normal. The heart was not enlarged. There was a soft systolic murmur at the apex. Blood pressure: 140/86. An umbilical hernia and also a right inguinal hernia were present.

Laboratory examinations. The Wassermann reaction of the blood was negative, although it previously had been positive at another institution, as noted above. The NPN was 35 mg., the cholesterol 143 mg., and the blood sugar 76 mg. per 100 c.c. The blood count and urine examination were normal. On lumbar puncture a clear, colorless fluid was obtained with an initial pressure of 180 mm. of water; the manometric studies were normal. Examination of the spinal fluid revealed 1 cell, negative Wassermann reaction, colloidal gold 0111100000, and globulin faint trace. X-ray studies of the skull showed a normal sella turcica; the A-P diameter was 10 mm. There was evidence of calcification in the cerebral and cerebellar falces. The mucosa of both maxillary and frontal sinuses, and also of the right ethmoid was hypertrophic. The optic foramina were normal in appearance. X-ray studies of the chest revealed no evidence of consolidation or infiltration of either lung, but the pleura was thickened in the fourth interspace on the left side and in the left costophrenic sinus.

TABLE 2

PROGRESS OF VISUAL ACUITY IN CASE 6

Duration	Acuity L.	Acuity R.
9–8–38	P.L.* No color vision	2/200 ("E" indistinct) No color vision
9–8–38	Operation	
1 day	P.L.	
37 days	P.L.	Sees curb on street more distinctly
60 days	P.L.	Counts fingers Objects appear sharper
66 days	P.L.	3/200 ("E" sharper) Return of color vision; red and blue
164 days	P.L.	1/200 Reads "40" line of Snellen chart at 20 cm. Retains color vision; red and blue. No longer needs an escort

* P.L. = light perception.

Diagnosis. Syphilitic arachnoiditis of the optic chiasm and optic nerves.

Treatment. It was not expected that operation would restore vision in the left eye because of the long duration of blindness. However, it was hoped that vision in the right eye could be improved sufficiently to prevent total blindness. For that reason, surgical intervention was recommended.

Operation. On September 8, 1938, Dr. Wingebach reflected the usual right transfrontal osteoplastic flap to expose the region of the optic chiasm. The skull was very thick. The bone flap was turned down with considerable difficulty because of adhesions between the bone and the dura; the latter was adherent to the skull especially near the midline, and appeared to be somewhat thickened anteriorly. Its vascularity was increased. A flap of dura was turned back, and then the anterior horn of the right lateral ventricle was entered with a needle to remove some cerebrospinal fluid. The purpose of this procedure was to reduce the volume of the brain and thus aid exposure. The frontal lobe was then retracted and an excellent view of the chiasmal region was obtained. The brain itself presented no abnormal appearance. At the base of the skull near the optic chiasm were numerous bands and adhesions completely encircling both optic nerves and apparently compressing them. The left optic nerve was about two thirds the size of the right one. Whether this wasting was due to intrinsic degeneration of the optic fibers or secondary to the adhesions around the nerve could not be determined. There was no evidence of a tumor mass. Anterior to the chiasm was a small collection of fluid which was evacuated. The adhesions described above were freed by blunt dissection. The patient's condition at the end of the operation was good.

Postoperative course. On the first postoperative day—that is, on September 9, 1938—the patient stated that he saw objects more clearly, although on examination this could not be substantiated. For some time thereafter, he insisted that "he strained much less" to see objects. He frequently stated that objects did not appear as flat as before, and asserted that they had greater depth. However, he was a very enthusiastic individual; consequently his statements were accepted with caution.

The patient was discharged on October 8, 1938, without any certain objective improvement in the visual fields or acuity. He returned frequently for check-up. On October 14, 1938 (37 days after operation), he reported that when he crossed the street, he saw the curb more clearly and did not stumble over it as he did before.

On November 13, 1938 (66 days after operation), visual acuity in the right eye was 3/200; the patient stated that the letter "E" of the Snellen chart appeared sharper and brighter. There was also a return of color vision. With the right eye he was now able to recognize red and blue 30-mm. test objects, but not green. The left eye remained unchanged. The central visual fields could now be charted accurately for the first time (fig. 6).

On February 19, 1939 (5½ months after operation), visual acuity had increased in the right eye to such an extent that the patient was able to read the "40" line of the Snellen chart held in his hand at a distance of 20 cm. in a dim light. However, the acuity in that eye was only 1/200 when he attempted to read the Snellen chart in a bright light. The discrepancy between these two readings was probably due to the fact that the patient could not see so well in a bright light as he could in a subdued light, particularly

when fatigued. The progress of visual acuity is charted in table 2. The peripheral visual fields charted with a 5-mm. white test object (fig. 5) showed improvement in the right eye; the test object was seen more clearly than it was when figure 4 was charted, although a central scotoma could now be defined. The central fields charted in figure 7, compared with those in figure 6, likewise showed improvement in the right eye. The left eye remained unchanged.

Comment. The rate of improvement in this case was slower than in case 1, and the degree of improvement also less marked. This was to be expected in view of the long-standing history of visual impairment in both eyes, 11 years in the left and 5 years in the right. As already noted, operation was proposed not with the expectation of restoring vision in the left eye, but with the purpose of improving it sufficiently in the right eye to prevent total blindness. This goal was achieved and the postoperative visual improvement in the right eye, albeit slight, justified the surgical procedure. It was no longer necessary for the patient to have his wife escort him to the hospital, and he cheerfully boasted that he was able to stay out late at night by himself and find his way without difficulty. The absence of visual improvement in the left eye was due to the marked atrophy of the left optic nerve, which was found at operation to be so greatly reduced in size as to be irreparable.

In evaluating the progress of the visual acuity in the right eye, it is difficult to explain the difference in visual-acuity readings taken 66 and 164 days after operation. The readings made from a Snellen chart on these two occasions under similar conditions of strong light were 3/200 and 1/200, respectively. However, in a dim light, there was definite evidence that the visual acuity in other respects had improved with time; for on the day that visual acuity was reduced to 1/200 in a strong light the patient was nevertheless able to read the Snellen chart in a subdued light at 20 cm. as far as the "40" line. This he could not do 66 days after operation. That visual acuity had not regressed is evidenced also by the expansion of the central fields and diminution of the relative scotoma in the peripheral fields and the retention of the gain in color perception. The patient could identify red and blue, which he could not do before operation.

At operation the adhesions in this case did not resemble those found in case 1. In the latter, the chiasm was surrounded by a thick, grayish exudate which extended to the surface of the brain. In the former, case 6, the adhesions were in the nature of thin bands, encircling and binding down the chiasm and optic nerves (and apparently compressing them), but not extending over the cortex.

In addition to the syphilitic arachnoiditis around the optic chiasm, it was thought that the patient had signs of pyramidal-tract disease on the right side because of the increased knee jerk and diminished abdominal reflexes on that side. The absent ankle jerks were considered as evidence of dorsal-root involvement.

This case presents another point of therapeutic interest. Despite intensive and skillful antisyphilitic treatment at another institution, the decline of vision in the left eye not only was unarrested but went on to blindness. Furthermore, the vision in the other eye, which was normal at the time this treatment was begun, also became impaired. It is pertinent to note, therefore, that whereas these conservative measures failed even to arrest the disease, surgical intervention actually improved vision to some degree in one eye.

CASE 7 (M. A.). BLIND IN BOTH EYES, TWO YEARS IN THE RIGHT AND NINE MONTHS IN THE LEFT. BILATERAL PRIMARY OPTIC ATROPHY. WASSERMANN REACTION IN THE BLOOD AND IN THE CEREBROSPINAL FLUID 4 PLUS. THIRTY CELLS, ALL LYMPHOCYTES, IN THE SPINAL FLUID. COLLOIDAL GOLD REACTION 1344221100. CRANIOTOMY. LIBERATION OF CHIASMAL ADHESIONS. IMPROVEMENT OF VISION, ESPECIALLY IN THE LEFT EYE.

Clinical History. M. A., a white female, aged 39 years, was admitted to the neurological service of Bellevue Hospital on August 20, 1938, with the complaint of progressive loss of vision in both eyes. About two years before admission the patient suddenly noticed that the right eye was covered by a "veil" which so impeded vision that all she could perceive with that eye was light. This condition became progressively worse until six months before admission, when a slight but not very appreciable change for the better occurred. That this change was negligible is attested by the fact that on admission vision in the right eye, as recorded in the physical examination below, was greatly impaired. About nine months before admission and immediately following the death of her husband, the patient suddenly lost vision in the left eye. Because of blindness in both eyes she frequently bumped into objects, was unable to go out alone, and needed an escort when she left the house.

The patient was unaware of syphilitic infection in herself or her husband, and never received antisyphilitic treatment. In 1929, a "lump" in the right inguinal region was incised and drained. In 1931, the patient was operated on for an infected ovarian cyst, following the removal of

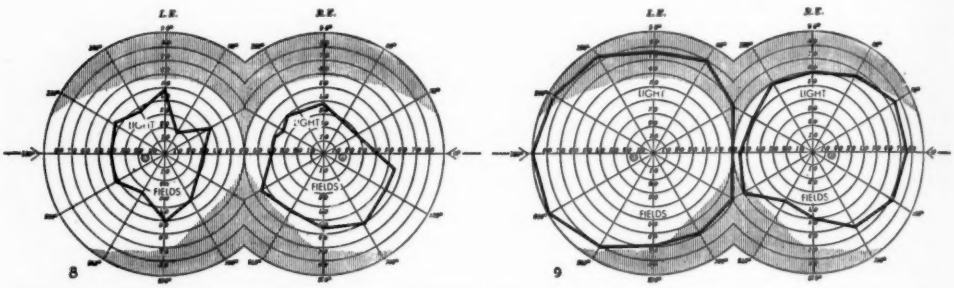

Fig. 8 (Hausman). Case 7 (August 24, 1938). Visual fields before operation. Both eyes: blind; light fields mapped with dim ophthalmoscopic bulb at 250 mm. Test objects were not seen. Visual acuity: L.E., detection of hand movements at one foot; R.E., same as L.E.

Fig. 9 (Hausman). Case 7 (November 19, 1918). Visual fields 46 days after operation. Both eyes: light fields mapped with dim ophthalmoscopic bulb at 250 mm., showing marked improvement compared with figure 8. Visual acuity: L.E., detects hand movements at one foot; R.E., reads "50" line of Snellen chart held in hand in dim light.

which peritonitis developed. The patient presented a history of alcoholism and had been in the habit of drinking one-half pint of whiskey daily over a considerable period. She had had no miscarriages. Two children, 9 and 16 years of age, are living. Menopause occurred following oophorectomy.

Physical examination. The patient was blind in both eyes. She could not recognize objects held close to her eyes nor could she count fingers even at a short distance. She recognized only movement. Vision O.S., hand movements at one foot; O.D., perception of light, and at times, hand movements at one foot. She could

not identify colors. The visual fields could be charted only with the light of an ophthalmoscopic bulb in a dark room; they showed general peripheral contraction (fig. 8). There was bilateral primary optic atrophy. The pupils were of medium size and unequal; the left slightly irregular and larger than the right. Neither reacted to light but both responded slightly and equally on near fixation.

The rest of the neurological examination was negative. Smell function was normal. The deep reflexes were active. There were no pathological reflexes. There were no sensory disturbances. Heart and lungs were normal; blood pressure: 110/75.

Laboratory examinations. Blood examination revealed: Wassermann reaction 4 plus; RBC 3,800,000; hemoglobin 90 percent; WBC 5,8,00; polymorphonuclears 68 percent; lymphocytes 30 percent; monocytes 2 percent; NPN 31 mg., and sugar 93 mg. per 100 c.c.

Lumbar puncture revealed a clear, colorless fluid under normal pressure; the manometric studies were normal. The spinal fluid contained 30 cells, all lymphocytes; the Wassermann reaction was 4 plus; colloidal gold 1344221100; protein 55 mg. per 100 c.c.; Pandy 1 plus; Ayala index 2.1.

X-ray studies of the head showed the bones of the skull to be of normal thickness; the sella turcica normal. There were no intracranial calcifications; the optic foramina were normal in shape. The mucosa of the left maxillary sinus was slightly hypertrophic; the other accessory nasal sinuses were normal. X-ray examination of heart and lungs was negative.

Diagnosis. Syphilitic arachnoiditis of the optic chiasm and nerves.

Treatment. The patient was started on bismuth and neoarsphenamine. She received six injections of neoarsphenamine (0.1 to 0.6) and showed no improvement. Because of our favorable experience in the previous cases (cases 1 and 6), it was considered best to recommend surgical intervention without further delay, inasmuch as the patient was blind in both eyes. Antisyphilitic chemotherapy was also instituted 17 days after operation.

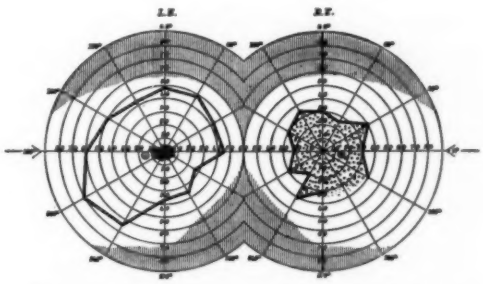

Fig. 10 (Hausman). Case 7 (March 2, 1939). Visual fields 149 days after operation. L.E.; 5-mm. white test object at 250 mm.; cross-hatched area, central scotoma. R.E., 30-mm. white test object at 250 mm. Entire shaded field indistinct. The inferior temporal portion of the field was not well defined; patient was too fatigued at this point. These fields, compared with figures 8 and 9, show definite improvement. Visual acuity: L.E., reads "20" line of Snellen chart held at arm's length in dim light; fatigues easily; R.E., 1/200 blurred.

Operation. On October 4, 1938, craniotomy was performed by Dr. J. King. A right osteoplastic flap was turned down in the usual manner. The exposed dura was not tense and pulsated very freely. The right ventricle was tapped, and 20 c.c. of fluid evacuated, thereby reducing the pressure considerably. The dura was incised and reflected in the anterior fossa. The right frontal lobe was retracted very slowly. There were no adhesions between the dura and the cortex of the brain, such as were found in case 1. Neither the cortical vessels nor the cerebral cortex showed any unusual gross pathology. When the region of the right optic nerve came into view a definite grayish, weblike structure was seen binding down the optic nerve. It stretched across to the other side and

posteriorly enveloped the entire chiasm. When this adhesive process was freed, an excellent view was obtained of the chiasm and both optic nerves, which appeared otherwise not unusual. The patient at the end of the operation was in very good condition.

Postoperative course. Like case 1, the patient showed immediate improvement in visual acuity after operation (table 3). On the first postoperative day the patient could see much better in a dim light. For that reason she was given the Snellen chart to hold in her hand in a dim light, and at a distance of 2 feet she was able to read the "50" line. There was no question as to the accuracy of this performance. On the ninety-eighth postoperative day the patient was able to read the "70" line of the Snellen chart in a dim light at a distance of 2 feet. Five months after operation, she was able to read the "20"

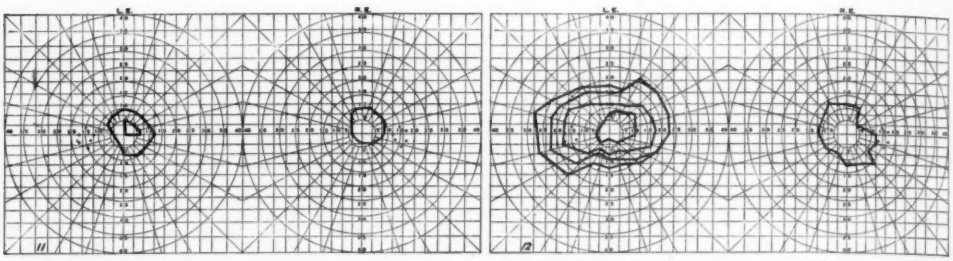

Fig. 11 (Hausman). Case 7 (November 13, 1938). Visual fields 40 days after operation. Central fields mapped on modified Bjerrum screen at 1,000 mm. L.E., 15- and 42-mm. white test objects. R.E., 42-mm. white test object. Visual acuity: L.E., 2/200; R.E., detection of hand movements at two feet.

Fig. 12 (Hausman). Case 7 (January 10, 1939). Visual fields 98 days after operation. Central fields mapped on modified Bjerrum screen at 1,000 mm. L.E., 5-, 12-, 25-, and 42-mm. white test objects. R.E., 42-mm. object. Left eye was examined first. Patient fatigued easily and for that reason only one test object was used to map the field in the right eye. Fields compared with figure 11 show expansion. Visual acuity: L.E., reads "70" line of Snellen chart held in hand in dim light; R.E., unchanged.

was able to distinguish between 1 and 2 fingers held close to the left eye. On the third postoperative day she could count fingers at a distance of one foot with that eye. Six days after operation the patient could identify with the left eye such objects as a pen, pencil, tuning fork, and scissors held at a distance of 1½ feet. On the eighth postoperative day she was able to count fingers at a distance of 4 feet, due to the continued improvement of visual acuity in the left eye. Thirty-six days after operation visual acuity in the left eye was 2/200. With this eye and with the Snellen chart in the usual position the patient was able to see the large "E," but stated that the bright light was confusing to her. She added that she line of the Snellen chart in a dim light at a distance of 200 mm. Six-and-a-half months after operation the patient was able to read newspaper headlines in daylight at a distance of one foot. She stated that she was able to get about by herself on the street, was able to step on to the sidewalk without stumbling on the curb, and no longer needed a companion.

In the right eye there was only slight improvement in the visual acuity, as indicated in table 3. Thirty-six days after operation, with the Snellen chart held in a dim light at 2 feet, the patient stated that some parts of the chart were darker than others, but she could not make out letters or figures. Forty days after operation acuity had improved from the detection

of hand movements at one foot, to their detection at two feet. Five months after operation visual acuity in this eye was 1/200 (blurred).

The improvement in visual acuity was reflected in the expansion of the visual fields, likewise greater in the left eye than in the right (figs. 8, 9, and 10). Forty-six days after operation the light fields showed definite expansion (fig. 9). Further evidence of improvement was furnished 149 days after operation; the fields in the left eye could be charted for the first time with a 5-mm. white test object at 250 mm. (fig. 10). The peripheral field was irregularly contracted and contained a central scotoma. In the right eye, the fields were charted with a 30-mm. white test object at 250 mm.; a smaller test object could not be used with accuracy. The peripheral field was greatly contracted; a relative scotoma was present (fig. 10).

The central fields are charted in figures 11 and 12, 40 and 90 days, respectively, after operation. They show improvement in both eyes, likewise greater in the left than in the right. It should be noted that the central fields could not be charted before operation.

Comment. The degree as well as the rate of visual improvement differed in both eyes. This disparity was in keeping with the relative duration of blindness in each eye. The left eye, blind nine months, showed greater improvement than the right, blind two years. It is too early to predict the degree of improvement which may be expected. Up to the present date visual progress has been constant, but the right eye has not kept pace with the left.

The adhesions around the optic chiasm and nerves resembled those in case 6. However, the acute onset of visual disturbance suggests the possibility of a vascular lesion in the optic fibers, in addition to the adhesions which were found at operation. To what extent the possible existence of this additional lesion may influence the postoperative restoration of visual function remains to be seen.

Although antisyphilitic therapy was instituted 17 days after operation, it should be noted that in this case, as in case 1, improvement set in immediately after the chiasmal adhesions were removed. It is safe to assume, therefore, that the improvement was due to the surgical procedure rather than to the antisyphilitic medication.

TABLE 3

PROGRESS OF VISUAL ACUITY IN CASE 7

Duration	Acuity L.	Acuity R.
8–24–38	Blind (9 mos.) 1/HM*—No color vision	Blind (2 yrs.) 1/HM—No color vision
10– 4–38	Operation	
1 day	Distinguishes 1 & 2 fingers	P.L.
3 days	1/finger	1/FM†
8 days	4/fingers	1/HM
36 days	2/200 in bright light. Reads "50" line at 2 feet in dim light	
40 days	2/200	2/HM
98 days	Reads "70" line at 2 feet (dim light)	
149 days	Reads "20" line at 20 cm. (dim light)	1/200 (Blurred)
197 days	Reads headlines. Can see curb. Walks by herself	

* 1/HM = Detects hand movements at one foot.

† 1/FM = Detects finger movements at one foot.

SUMMARY

This is the second in a series of cases presenting the syndrome of syphilitic arachnoiditis of the optic chiasm and nerves. Six cases, thus far, have been studied. In three of them, case 1 of the first series and cases 6 and 7 of the present

series, craniotomy was performed, and in each instance adhesions were found at and removed from the optic chiasm and nerves. Only the three cases that came to operation have been considered in this report. Clinically, they were characterized by progressive loss of vision culminating rapidly in complete or partial blindness, primary optic atrophy, and evidence of syphilis.

In case 1, at the time of operation, the left eye was blind and the right showed a temporal hemianopsia with great reduction in visual acuity. Color vision was lost in both eyes. The heteronymous character of the visual-field defect pointed to the chiasm as the site of the lesion. A craniotomy was performed, and exploration revealed dense adhesions around the optic chiasm and nerve. Soon after these were liberated vision began to return. This case is of particular interest now because of the long period of observation following operation. When it was first reported in 1937, the following comment was made: "The postoperative result as to vision was excellent. Liberation of the optic chiasm from the meningeal adhesions had an almost immediate effect. Whether or not this improvement in vision will be permanent remains to be seen; the case will have to be followed for a sufficiently long time to permit an accurate estimate of the prognosis." Now two years after operation, the answer to this question can be given. The end result as to the restoration of vision has been excellent, for the patient not only has made great progress in this direction but also has retained all her gains without any relapse. The visual fields have greatly expanded, and visual acuity is 16/15 in one eye and 16/15—2 in the other. Color vision for red and blue also has returned.

In case 6, at the time of operation, the left eye was completely blind except for a small sector of light perception; the vision in the other eye was so impaired that the perimetric studies could not be used for the localization of the lesion. However, in view of the fact that the patient had received intensive antisyphilitic chemotherapy when vision first began to fail, and the loss of vision had continued despite this treatment, operation was advised in the anticipation of the danger of impending total blindness. A craniotomy was performed and adhesions were found around the optic chiasm. In addition, the left optic nerve was found to be markedly atrophied. It is not surprising, therefore, that there has been no visual improvement in this eye, blind eight years. However, following the liberation of adhesions, visual improvement set in slowly and continued gradually in the right eye. Vision in this eye, blind five years, has improved sufficiently to permit the patient to get about by himself. About five-and-one-half months after operation, the acuity in this eye had so improved that the patient could read the "40" line of the Snellen chart at 20 cm. Furthermore, color vision for red and blue also had returned in this eye.

In case 7, at the time of operation, visual acuity in both eyes was so reduced that the patient could not get about by herself; the visual-field defect, likewise, was too far advanced to aid in the localization of the lesion. However, in view of the rapid loss of vision and the imminent danger of total blindness, operation was advised. The favorable results obtained in cases 1 and 6 were a factor in this decision. A craniotomy was performed and exploration revealed adhesions around the optic chiasm and nerves which were liberated. Improvement set in gradually; about one-and-one-half months after operation, the light fields showed marked expansion in both eyes. In the right eye, blind two years, large test objects could be charted, and visual acuity, five months after opera-

tion, had improved to 1/200. There has been greater progress in the left eye, blind for nine months before operation; visual improvement in this eye set in very quickly. Before operation, the visual acuity in this eye was the detection of hand movements at one foot; eight days after operation, the patient was able to count fingers at four feet with this eye, and 149 days after operation, she could read the "20" line of the Snellen chart at 20 cm. The patient has improved to the extent that she now goes out by herself and no longer needs a constant escort.

Each case presented serological evidence of syphilis in the blood, spinal fluid, or both, at one time or another. In cases 1 and 7, the Wassermann reaction was 4 plus at the time of operation; in case 6 it was negative, although it had previously been positive. Examination of the spinal fluid in case 1 revealed 20 lymphocytes and a negative Wassermann reaction; in case 6, 1 cell and a negative Wassermann reaction; and in case 7, 30 lymphocytes and Wassermann reaction 4 plus. The colloidal gold curve in case 1 was 0011221100, in case 6, 0111100000; and in case 7, 1344221100.

Since these cases have hitherto been diagnosed as tabetic optic atrophy, it is of interest to note what signs of tabes were or were not present in each. In case 1 the pupils were equal, slightly irregular, and reacted sluggishly to light but well on near fixation. There was no evidence of tabes in the spinal cord. In case 6, the pupils were of moderate size and did not react to light or on near fixation. There was evidence of tabes in the spinal cord; the ankle jerks were absent and the testes were insensitive to pressure. There was also slight evidence of right pyramidal-tract disease; the right knee jerk was more active than the left, and the right abdominal reflexes were diminished. In case 7, the pupils were of medium size but unequal; they did not react to light and responded fairly well on near fixation. There was no clinical evidence of tabes in the spinal cord.

It is essential, in the evaluation of the benefits of surgical therapy in these cases, to note that following the liberation of the adhesions, vision improved to a varying degree in each instance, the rate and degree of improvement depending upon the duration of blindness. The most striking result was obtained in case 1, in which there was loss of vision in both eyes for two years. In case 6, the visual improvement was less marked and in keeping with the longer duration of visual impairment —11 years in one eye, and 5 in the other. In case 7, although the duration of blindness was only nine months in one eye and two years in the other, the degree of improvement, contrary to expectation, did not parallel that of case 1. This retardation in case 7 may be due to the presence of a vascular lesion of the optic fibers in addition to the adhesions that were found at operation. This complicating factor is suggested by the acute onset of blindness in each eye. The fact remains, however, that the eye blind only nine months showed greater improvement than the eye blind two years. The degree of postoperative visual improvement in this case is, therefore, also commensurate with the duration of blindness; in this respect the results conform with those obtained in cases 1 and 6.

The adhesions in case 1 were in the nature of a dense adhesive exudate which surrounded the optic chiasm and nerves and also covered the surface of the frontal lobe, so that there were bands between the cortex and the dura. The adhesions in cases 6 and 7 consisted of thin strands which enveloped the optic chiasm and nerves, but did not extend over the frontal lobes. In case 6, there was also marked wasting of the left optic nerve.

Conclusions

Cases manifesting the syndrome of syphilitic chiasmal arachnoiditis have hitherto been diagnosed as tabetic optic atrophy. That cases of syphilitic primary optic atrophy due to parenchymatous disease of the optic nerve exist is, of course, not to be underestimated. But in view of our new experience, the outlook upon the pathogenesis of syphilitic optic atrophy should be broadened. The point to be emphasized at present is that adhesions may exist at the base of the brain in cases of syphilitic primary optic atrophy, with or without signs of tabes dorsalis in the spinal cord.

Certain signs are helpful in arriving at the diagnosis of syphilitic chiasmal arachnoiditis. When patients with syphilis and primary optic atrophy present heteronymous visual-field defects, or multiple cranial-nerve lesions adjacent to the optic nerve, or when primary optic atrophy and syphilis are the only signs present, adhesions at the base of the brain in the region of the chiasm should be suspected. Visual-field studies should be made early and frequently so that in the future we may know more precisely the different types of field defects that may be present in such cases. Whether these perimetric studies will disclose other defects as helpful as the heteronymous in localizing the site of the lesion at the chiasm remains to be determined. Whether they will likewise prove helpful diagnostically in establishing the presence of optic adhesions remains to be seen. However, even when the visual field studies are not conclusive for diagnosis, the possible existence of adhesions around the optic chiasm and nerves should be kept in mind. This is important for therapeutic reasons, for once adequate antisyphilitic treatment in a case of syphilitic primary optic atrophy fails to arrest the progress of visual impairment so that blindness threatens, the patient should be acquainted with the prospects of surgical intervention. At this stage of management, even severe optic atrophy is no contraindication to surgery. When blindness is imminent, no reasonable therapeutic measure should be ignored.

Although the present series of cases is too small to warrant final conclusions, the results obtained thus far in the treatment of syphilitic optic atrophy due to adhesions justified the surgical approach. There was no mortality, and all patients did well after operation.

To Dr. Foster Kennedy, I am indebted for his interest in this problem; I am grateful to the ophthalmologic service of Dr. Webb Weeks at Bellevue for their coöperation, especially to Miss De Mars, for her painstaking care in mapping the visual fields. I also wish to thank Dr. Samuel Brownstein of the Bellevue Neurological Service for his coöperation in following the progress of these patients with me.

140 East Fifty-fourth Street.

Reference

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PSEUDOMELANOMAS OF THE IRIS*

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Clinical findings which appear to be similar or identical often prove to be of entirely different pathogenesis when detailed clinical studies just prior to enucleation are accurately compared with the histological findings.

The name "pseudomelanoma" is suggested here as an appropriate term for a group of false tumors, or pigmented pseudotumors of the anterior surface of the iris, which simulate true benign melanomas or so-called nevi of the iris but which present entirely different types of basic pathology.

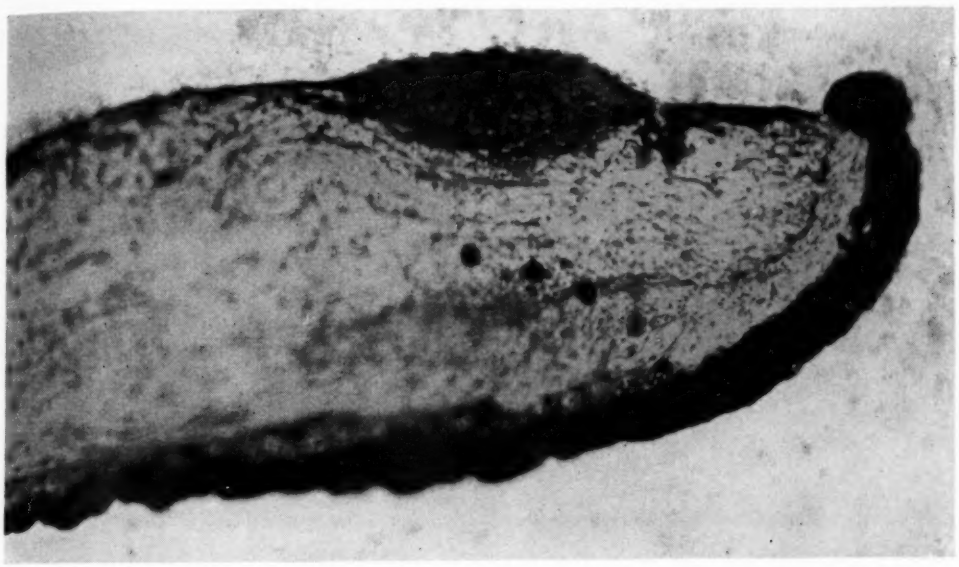

Fig. 1 (Klien). Pigmented tumefaction on anterior surface of iris (pseudomelanoma type 1). Low-power view.

The first eye under discussion is the left eye of a male patient, 27 years of age, who had suffered a penetrating injury five weeks prior to enucleation. The principal consequences of the trauma were a scleral laceration near the temporal limbus, a subluxation of the lens, and an extensive retinal detachment. At the time of enucleation the aqueous had a hemorrhagic tinge, but no evidence of inflammation nor exudation was noted. There were two pigmented, slightly raised nodules, each 1.5 by 2.0 mm. in size, on the surface of the hazel-colored iris. These were interpreted as benign melanomas. In addition the entire surface of the iris, as seen by the slitlamp, appeared to be studded with the most minute pigment dots.

Upon histologic study, the pigmented nodules were seen to be small reddish-brown tumors (fig. 1) which projected slightly above the surface level of the iris and which were definitely differentiated

* Read before the Chicago Ophthalmological Society, April 15, 1940. From the Department of Ophthalmology, Rush Medical College, University of Chicago.

from true benign melanomas only by study of depigmented sections. There was a similar node in the ciliary portion of the iris, where it escaped clinical observation.

In the depigmented sections, these nodes were seen to consist of a large number of cells with an endothelial type of nucleus, and a polymorphous cytoplasm, some with obtuse pseudopodic extracellular or was contained within large vesicular monocytes.

There was a moderate generalized round-cell infiltration of the iris, including a small number of monocytes near the anterior surface, especially contiguous to the nodes.

Friedenwald and Pierce[1] have shown experimentally the role that is played by

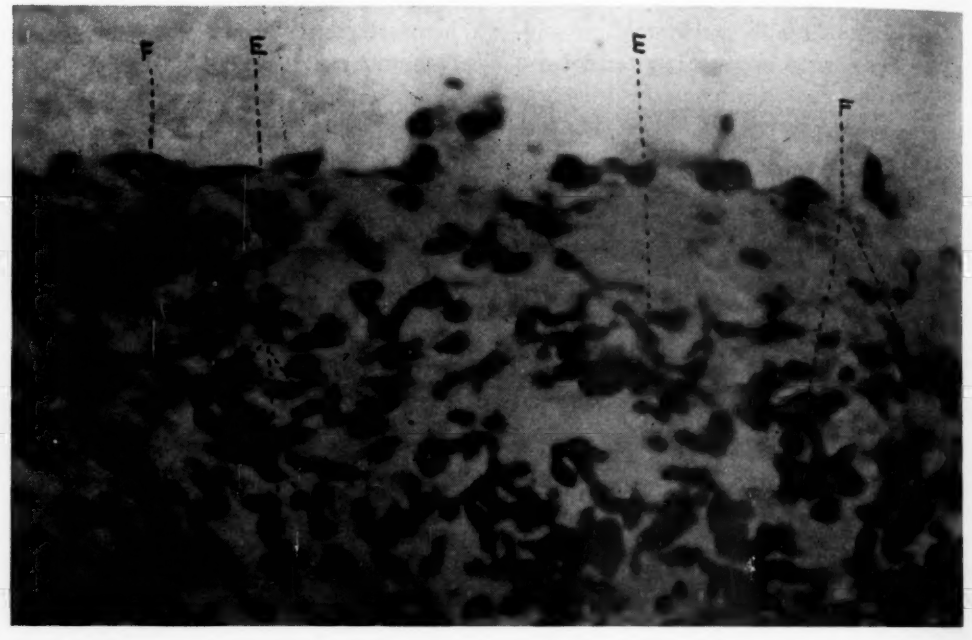

Fig. 2 (Klien). High-power view of same area as shown in figure 1. Depigmented section. E, endothelial type cells of anterior-border layer, some with polymorphous cytoplasm; F, fibroblasts.

tensions. In the deeper layers, most of the cell nuclei were parallel to the iris surface, while in the superficial strata, the nuclei stood in perpendicular or oblique positions (fig. 2). Fibroblasts were also present, but were less numerous than the cells just described.

These pseudotumors derived their color from a rusty brown pigment, most of which was contained within the endothelial type of cells. In the central and anterior portions of the nodes, the small remainder of the pigment was either extracellular or was contained within large vesicular monocytes.

There was a moderate generalized round-cell infiltration of the iris, including a small number of monocytes near the anterior surface, especially contiguous to the nodes.

Friedenwald and Pierce[1] have shown experimentally the role that is played by the anterior-border layer of the iris in the absorption of foreign material. A very short time after their introduction into the anterior chamber foreign particles appear within the endothelial type of cells of the anterior border layer, which are assisted in their phagocytic activity by monocytes appearing in the adjoining tissues somewhat later. The entire surface of the iris participates homogeneously in this activity.

The finding of circumscribed areas indicative of this surface activity several

weeks after the introduction of foreign substances into the anterior chamber, in this case blood, suggests a localized disturbance in the carrying away of this substance. If such an accumulation of foreign material on the anterior surface of the iris is not absorbed within a certain time a process of assimilation sets in. From the appearance of these pseudomelanomas it would seem that the first step toward the accomplishment of this is a proliferation of some of the elements of the anterior-border layer, similar to that occurring in chronic glaucoma (Elschnig[2]). As these cells proliferate, they gradually take up the foreign substance. Fibroblasts, possibly derived from the monocytes in the surrounding tissues (Maximow[3]), grow into these areas later and finish the process of assimilation.

Thus the origin of this type of pseudomelanomas appears to be an irregularity in the ad- and absorptive activity of the anterior-border-layer cells of the iris, with subsequent proliferation of these cells.

Further study of the iris surface in the same eye showed a second type of pigmented tumefactions, which arose in the neighborhood of blood vessels coursing near the surface. The adventitia cells of these vessels participated in the phagocytosis of the foreign material, which resulted in many places in an eccentric proliferation of these cells on the side nearer the surface. In figure 3 such small nodules in a depigmented section are shown to be made up almost exclusively of proliferated adventitia cells, which rest hoodlike upon the blood vessels and project above the anterior surface level of the iris. These pigmented nodules all seem to be smaller than those of the first type described, whose origin lies in the activity of the anterior-border layer of cells. They

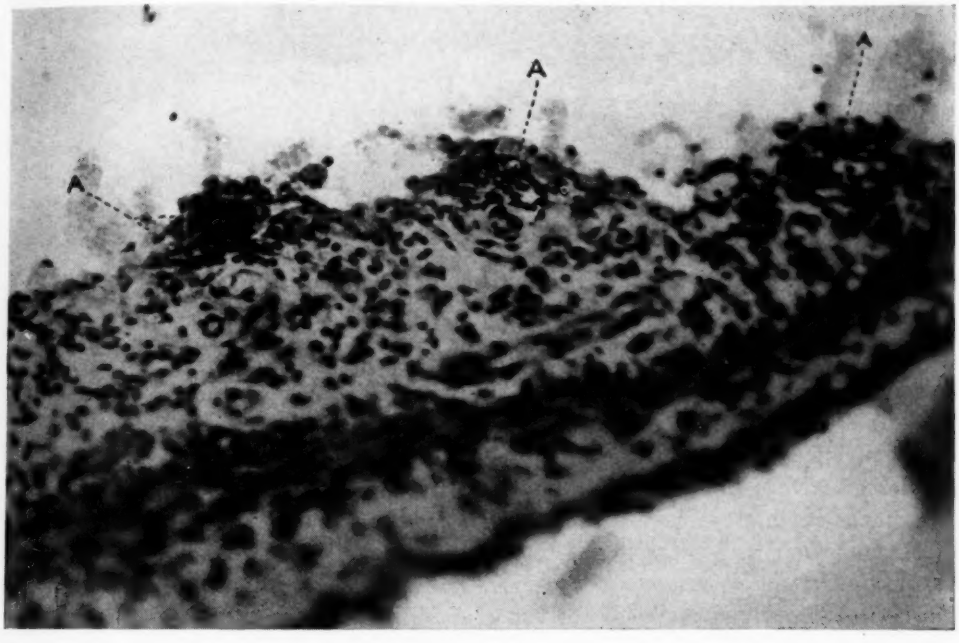

Fig. 3 (Klien). Proliferated adventitia cells of blood vessels near the anterior surface of the iris (pseudomelanoma type II). Depigmented section. A, proliferated adventitia cells.

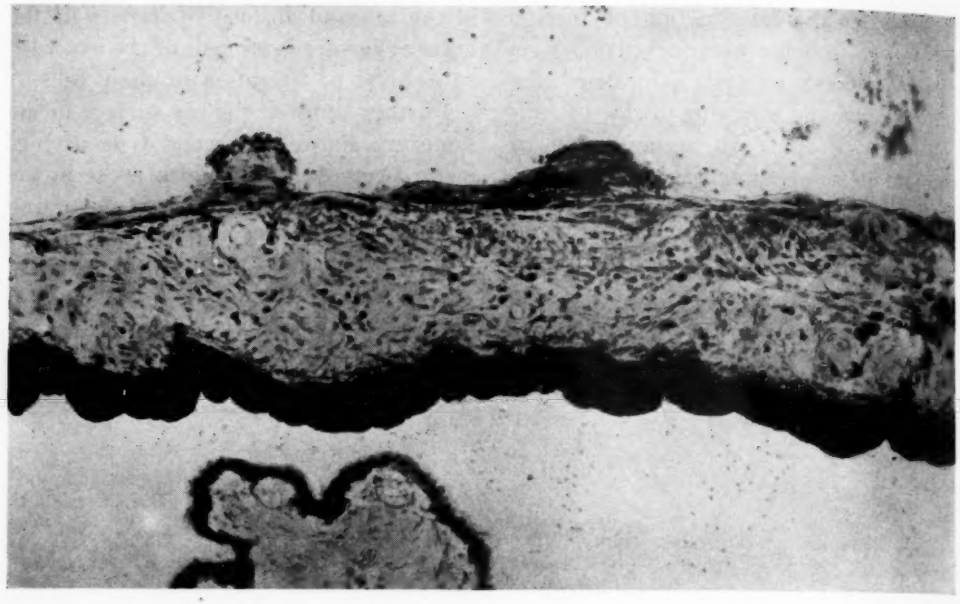

Fig. 4 (Klien). Pigmented tumefaction on anterior surface of iris consisting of proliferated corneal endothelium. Low-power view.

may correspond to the minute brownish dots which were observed with the slitlamp.

The pigment contained within the phagocytes of each of these types of pseudomelanomas in this eye was undoubtedly of hematogenous origin. With the ferrocyanide stain there was no Berlin-blue reaction within these nodules, but some of the less-pigmented, vesicular monocytes on the iris surface stained diffusely blue or contained a few blue granules. A deep blue color, however, marked the slitlike suprachoroidal space. Within it and in the adventitia cells of some of the larger choroidal vessels were deposits of coarse bluish-green granules.

These staining properties indicate hemosiderin formation and phagocytosis at the time of enucleation, mainly in the suprachoroidal region, while only a small amount of it was present in the iris. The iron-negative pigment in the phagocytes of the pseudomelanomas was either hematoidin or condensed hemoglobin at a stage just prior to the change of its histochemical properties and its differentiation into several pigments.

The second of the two eyes here described is the left eye of a female patient 65 years of age. At the time of enucleation the eye was blind and glaucomatous, with a tension of 44 mm. Hg (Schiötz), and there was an early ulcus serpens. The eye had been losing vision for six years, and for six months had undergone repeated attacks of redness and severe pain. Upon clinical examination, several light-brown elevated nodules, grossly resembling nevi, were visible in the atrophic blue iris. Under the slitlamp they were seen to have a peculiar glassy appearance.

The histologic findings in this eye did not give definite information concerning the nature of the disease leading to this unilateral absolute glaucoma. For short stretches peripheral anterior synechiae were noted, and the spaces of Fontana were densely filled with pigmented debris. In most sections, however, the shape of

the chamber angle was normal. The findings in the posterior segment did not definitely point to a vascular accident but included marked retinal angiosclerosis.

Histologic examination of the iris, in a search for the pathogenesis of these pigmented elevations, revealed the anterior surface of the ciliary portion to be covered with corneal endothelium and a new-formed Descemet's membrane. In several places the endothelium had proliferated and formed nodular excrescences as shown in figures 4 and 5. These nodules consisted of 10 to 12 layers of elongated cells of corneal endothelium, and between them here and there thin layers of a homogeneous substance resembling Descemet's membrane. Due to the acute purulent iritis the anterior surface of the iris and its excrescences were lined with polymorphonuclear leucocytes.

Products of proliferation of the corneal endothelium similar to these have been observed on the posterior surface of the cornea in parenchymatous keratitis and covering defects of Descemet's membrane in various conditions, and have been given the rather appropriate name of endothelogenous connective tissue, since the endothelial cells of which it consists are elongated and resemble fibroblasts.

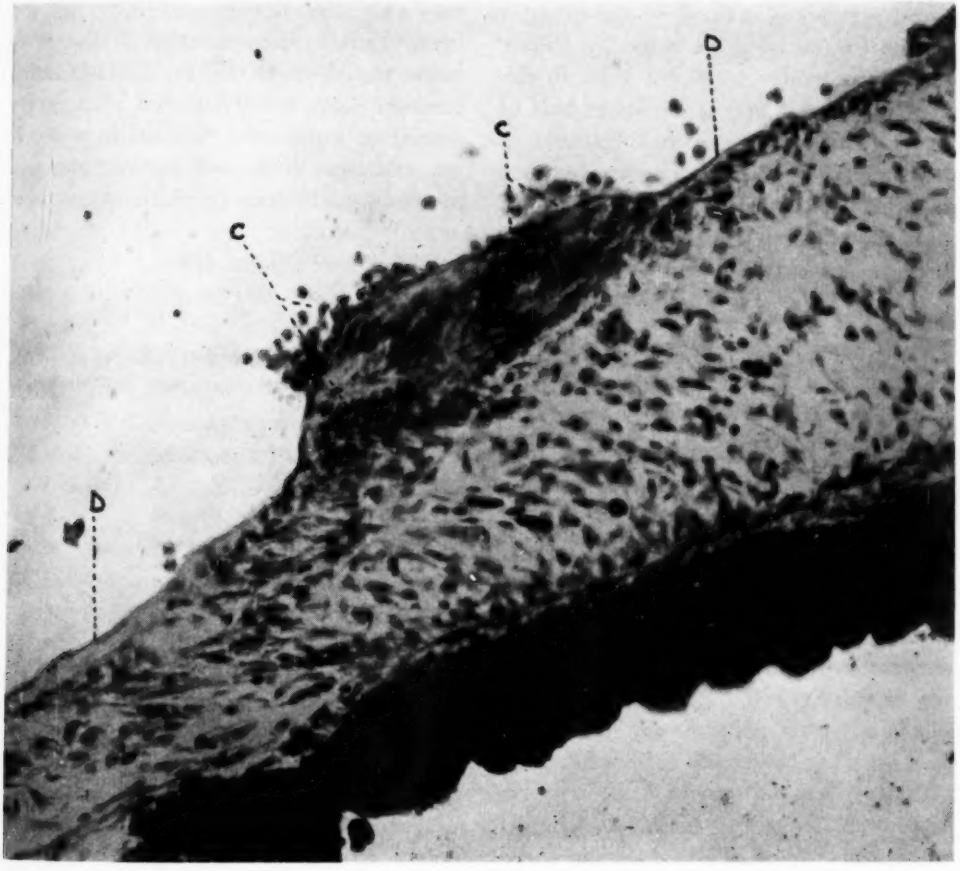

Fig. 5 (Klien). High-power view of same area as shown in figure 4. C, heap of endothelogenous connective tissue; D, new-formed Descement's membrane.

In the nodes described here, many of the endothelial cells contained dark-brown pigment granules which did not give the iron reaction and appeared to be melanin granules. The iris, in general, was atrophic with ill-marked surface pattern, and several of its excrescences were located at the former site of a crypt, which would suggest a mechanical factor in their formation.

This third type of pseudomelanoma of the iris thus had its origin in proliferation and phagocytic activity of the corneal endothelium, which had grown around the chamber angle onto the anterior surface of the iris.

A contribution to the literature of acquired pigmented lesions of the anterior surface of the iris was made by Pillat,[4] who demonstrated a patient with an elevated pigmented line in the lower half of the iris which developed in the course of a chronic iridocyclitis. The explanation given by Pillat was shrinkage of exudate on the surface of the iris, and pigment phagocytosis by the cells of the exudate. His observation, however, was clinical only.

Summary and conclusions

Pseudomelanomas of the anterior surface of the iris may arise through phagocytic activity and proliferation of: (1) the cells of the anterior-border layer of the iris, (2) the adventitia cells of blood vessels near the iris surface, and (3) the endothelium of the cornea whenever it has proliferated onto the anterior surface of the iris.

All three types of pseudomelanomas are permanent tumefactions of the iris, but their pigment content, which may be either hematogenous or autochthonous, may vary, and it is logical to assume the hematogenous pigmentation to be of a more transient character. Inflammatory conditions apparently do not play an essential or immediate role in their development; thus they are different from pigmented-organization products of exudate.

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[4] Pillat, A. Ophth. Gesellsch., Vienna, 1927. Zeit. f. Augenh., 1927, v. 62, p. 185.

KERATOPLASTY*

Comments on the technique of corneal transplantation. Source and preservation of donor's material. Report of new instruments. Part II.

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Circular partial penetrating keratoplasty

In order to familiarize myself with the trephine technique of partial penetrating keratoplasy, I began using the method of Thomas, which seemed to offer more advantages than the other procedures based upon the use of the trephine. For this technique, two special instruments were made:

(1) A set of trephine blades 4½, 5½, and 6½ mm. in diameter, which can be fitted to the trephine handle of Elliot (fig. 8 A. and B.). These three sizes were found to be the most practicable ones. A trephine manipulated by hand was also found to be more practical and easier to control than a motor-driven instrument.

(2) Special curved scissors of the spring type for cutting the cornea, provided with dull points to avoid injury to the lens (fig. 8 C.).

The other instruments needed for this procedure are those described for the previous method of square graft: three mosquito lid-clamp retractors; Elschnig's fixation forceps; double spatula; two toothless forceps; two 3/8-circle atraumatic needles provided with black braided silk size eight-0, and the needle holder.

After using the technique of Thomas for some time, several modifications were made to improve the operation:

Preparation of the patient, anesthesia, and preparation of the eye are the same as in the method of the square graft. Separation of the eyelids is obtained with the mosquito lid-clamp retractors. The leucomatous area of cornea to be removed is outlined with the trephine, care being taken not to penetrate into the anterior chamber, which would make it difficult to proceed with the operation (fig. 9A and B.). Fluorescein, 2 percent, is instilled to make the corneal incision more visible and facilitate the subsequent steps of the operation. A continuous corneal suture is inserted about 1½ mm. outside the edges of the outlined circle (fig. 9 C. and D.). This suture is destined to hold the transplant in position. To facilitate the insertion of the suture, which, in the case of the round graft, does not possess the corners used as points of reference in the square one, the diagram with the clock-dial arrangement illustrated in figure 9 D. may be used. A mental picture of the two principal diameters of the circle, vertical and horizontal, will help to insert the sutures correctly in the proper position and order, as illustrated in the figure.

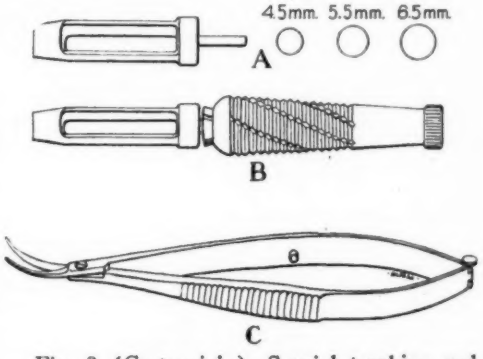

Fig. 8 (Castroviejo). Special trephine and scissors required for author's technique of circular partial penetrating keratoplasty.*

* From the Institute of Ophthalmology, Columbia Presbyterian Medical Center. Aided in part by a grant from the Francis I. and Elizabeth C. Proctor Fund.

Part I appeared in the preceding (January) issue.

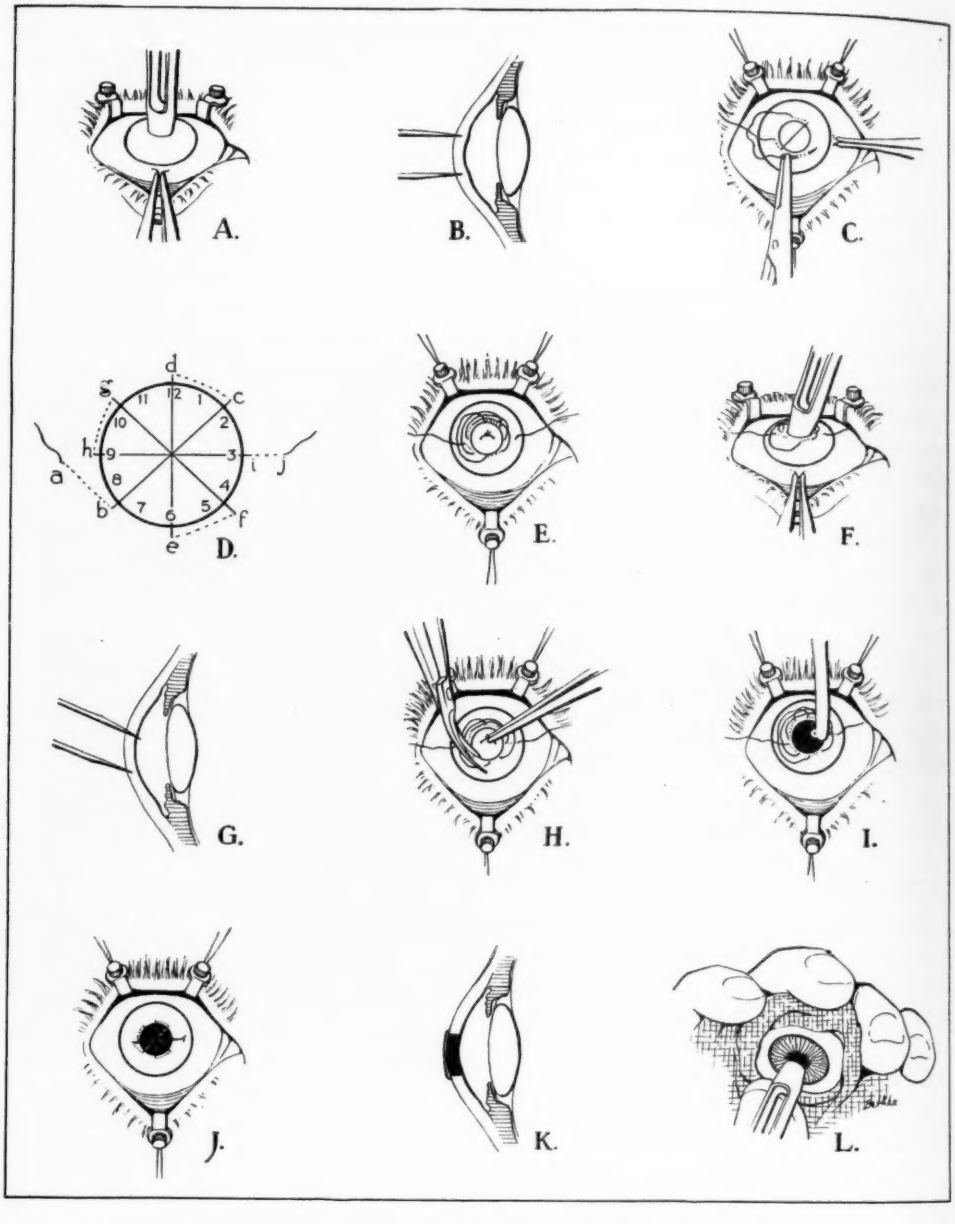

Fig. 9 (Castroviejo). Author's technique of circular partial penetrating keratoplasty.

Another suture is inserted within the outlined leucoma, which will be used to facilitate the removal of this segment (fig. 9 E.). The trephine is again applied to the previous incision, and rotated until about from one half to two thirds of the corneal thickness has been cut. Then the trephine is sloped slightly while continuing the rotation, until the blade enters the anterior chamber fig. 9 F. and G.), whereupon the aqueous drains and the cornea collapses. As soon as the anterior chamber

has been opened, the trephine is withdrawn and the remaining uncut edge of the incision is finished with special scissors, in a shelving manner, with an approximate beveling of 20 degrees (fig. 9 H.). During this last manipulation, with the aid of forceps, a gentle pull is exerted on the suture previously placed within the outlined leucoma. The purpose of this pull is to keep the leucoma away from the lens, thus preventing injury to this structure. The transplant, equal in size and shape to the removed leucoma, is obtained in a similar manner, but without beveling, from the eye of the donor, using the same trephine previously employed in the host's eye (fig. 9 L.). In the donor's eye the trephine may be used with more freedom to dissect the graft, since it does not matter if the intraocular structures are injured. For this reason, more of the edge of the graft, sometimes all of it, can be cut with the trephine alone. If there should remain some uncut portion, it should be incised without beveling, with the aid of the special corneal scissors. The clear transplant replaces the dissected leucoma (fig. 9 I.), and the continuous corneal suture is gently made taut without exerting excessive pressure (fig. 9 J. and K.), the knot lying either temporally or nasally away from the graft. Metaphen, or any other nonirritating antiseptic ophthalmic ointment is placed into the conjunctival sac, and a binocular bandage without pressure is applied.

Fig. 10 (Castroviejo). Photographs of clear circular corneal transplants.

The operation just described differs from that advocated by Thomas in the following details: (a) The continuous suture, instead of the double suture, as advocated by Thomas. (b) The application of the suture within the outlined leu-

coma to facilitate its dissection. (c) The use of a trephine of the same size in host and donor, instead of a smaller trephine for the donor, as advocated by Thomas. (d) The dissection of the graft without beveling, and only a slight beveling of the inner layers of the host, to fill the gap that is produced by the curling inward of Descemet's membrane and endothelium of the graft, giving a snug fit, thus favoring the prompt healing of the inner end of the incision and early restoration of the anterior chamber, and preventing anterior synechiae. Instead, Thomas advocates beveling in both host and donor's corneas, fitting the graft loosely, due to the fact that it is dissected with a smaller trephine.

This modified Thomas technique is offered to those who seem to be better adjusted to the use of the trephine than to the handling of the double-bladed knife; also to those who perfer to use a round graft to a square graft, for purely esthetic reasons. The reasons for my preference of the square graft have been discussed above. Figure 10 shows some of the results obtained in using the procedure just described.

Remarks on some methods of partial penetrating autokeratoplasty

Autokeratoplasty is, as the name indicates, the operation of transplanting a cornea, using a graft obtained from the same individual. This can be accomplished in two ways, either by dissecting the graft from a transparent cornea of a blind eye to replace a leucoma of the scarred cornea of the fellow seeing eye, or by obtaining the graft from the same eye that is to receive it. In the first case, the technique is the same as that employed for homokeratoplasty, the eye with the clear cornea furnishing the graft after enucleation. If the eye is not to be enucleated, the operation is carried out simultaneously in both eyes, exchanging grafts, the eye with scarred cornea receiving the transparent graft from the blind eye, and the blind eye receiving the leucomatous graft from the fellow eye. When the corneal graft is to be obtained from the same eye with the scarred cornea, it is necessary that part of the cornea furnishing the graft be transparent. The only indication for this type of operation for visual purposes is, therefore, when an eye has an opacity in the pupillary area greatly diminishing visual acuity, and an area of adjacent transparent cornea.

In these types of eyes, usually an optical iridectomy serves to improve vision considerably, thus avoiding the need for keratoplasty, which is a more serious operation, exposing the eye, therefore, to more serious complications. The improvement of vision to be obtained after optical iridectomy may be judged by the improvement obtained under strong mydriasis. The indications for iridectomy, the technique of localized dilatation of the pupil, and the technique of iridectomy in these cases of corneal opacity, especially when only a small area of transparent cornea remains available in the periphery, will be discussed in another article dealing with selection of cases for keratoplasty.

If dilatation of the pupil fails to show any satisfactory improvement of vision, a keratoplasty will be justified, and an autokeratoplasty may be considered. The two best techniques of partial penetrating autokeratoplasty follow.

The first one is derived from the Morax method of lamellar autokeratoplasty by transposition, but using a full-thickness graft instead of the lamellar one. The operation consists in exchanging a transplant obtained with the trephine in the transparent periphery of the cornea, with a similar disc obtained with the same trephine in the scarred pupillary

area (fig. 11 A.). The suture illustrated in figure 11 A. to hold the graft in position seems to be well adapted for this procedure. A needle armed with double silk thread is passed along the bridge of corneal stroma between the two outlined circles. Each thread is now threaded in a different needle, using one suture to hold the peripheral disc, and the other for the central one. One more separate suture for each disc is inserted to complete the cross stitches advocated by Thomas to hold a single graft.

The main objections to this operation are obvious: (1) Once the first disc has been obtained, the anterior chamber collapses, and it is very difficult, if not impossible, to obtain the second one with the trephine without traumatizing the intraocular structures. The use of devices to occlude the first perforation does not help in restoring the anterior chamber, nor the tension of the eye, making the dissection of the second disc just as difficult as if no occluders were used. (2) As soon as the anterior chamber collapses after dissection of the first disc, the tension of the eye falls and it is difficult or impossible to dissect the second disc of the same size and shape as the first one. (3) In order to maintain the grafts securely in place, it is necessary to use a suture twice as complicated as the one used in homo- or autokeratoplasties, where only one disc is made. (4) Unless a preliminary iridectomy has been performed, the iris in the vicinity of the peripheral disc is apt to become incarcerated, with subsequent danger of opacity of the graft, secondary glaucoma, or both. (5) The operation is twice as traumatizing as when only a single disc is made, and it is reasonable to suppose that healing will be correspondingly delayed and imperfect. (6) In order to replace the transparent graft in the pupillary area, the disc cannot be larger than 4 mm., due to the limitation of corneal surface. If they are smaller than 4 mm., excessive proliferation of connective tissue at the edges may occlude the small area available for visual purposes, with subsequent failure of the operation.

The second method of partial penetrating autokeratoplasty by rotation was described by Kraupa in 1914: With the aid of a trephine, a disc is made (fig. 11 B.) in the cornea sufficiently large to contain both the opacity to be shifted and an adjacent clear area of cornea. The disc is then rotated 180 degrees, in order to place the opacity towards the periphery and the transparent portion in the pupillary zone. The technique of Kraupa may be improved by securing the graft in position by a continuous suture in the manner advocated for the circular graft. The objections to this type of operation are: (1) In order that the transplant may be effective, it must be of a diameter of 6½ mm. or larger. When a transplant is larger than 7 mm., uneven healing, with subsequent nebulosity or opacity of the graft, easily takes place. (2) Unless a

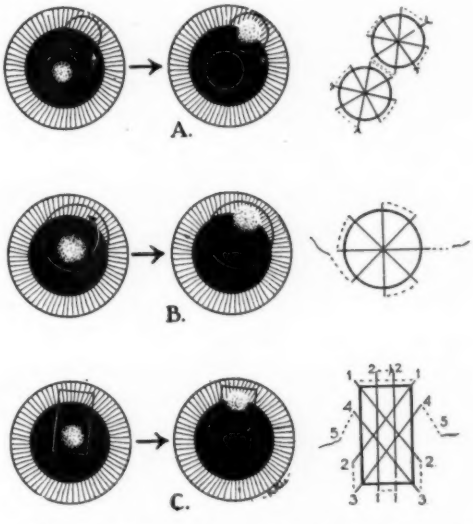

Fig. 11 (Castroviejo). Techniques of partial penetrating autokeratoplasty by transposition and rotation with diagram of sutures employed.

preliminary iridectomy has been performed, incarceration of the iris, especially at the periphery of the incision, is likely to occur, with subsequent tendency to opacity of the graft and secondary glaucoma.

I evolved another method of partial penetrating keratoplasty, based upon the method of Kraupa. This consists in making, with the aid of a double-bladed knife, keratome, and scissors, a rectangle 7 by 4 mm. in size, containing a clear area of peripheral cornea and the opacity of the pupillary area, as illustrated in figure 11 C. The graft is then rotated 180 degrees, in order to place the transparent area in the center and the opacity in the periphery. The graft is maintained in position by two sutures: one, a double-armed continuous suture which serves especially to support the corners and long edges of the rectangle the other suture supports mainly the short edges of the graft. This operation may be preferred to that of Kraupa because with a graft 7 mm. in diameter for the Kraupa operation, and 7 mm. in length for mine, the latter, by preserving the portions of the graft utilized for visual purposes, does away with the lateral segments of the Kraupa graft; thus the same practical results are obtained with a smaller incision.

However, the same objections made for the Kraupa technique pertain to this procedure. Healing of a graft 4 by 7 mm. in length, or larger, is not accomplished so easily as the healing of a smaller quadrangular graft. Unless a preliminary iridectomy has been performed, it is not infrequent to have incarceration of the iris in the peripheral portion of the incision, with the subsequent danger of opacity of the graft and secondary glaucoma.

It has been pointed out by several authors that autotransplants are likely to take and give better results than the use of homo- or heterotransplants. In regard to auto- and homotransplants, experimental work in animals' eyes showed that if a corneal flap is dissected loose from the surrounding tissue and allowed to heal in the same place, the postoperative course which follows is the same as that which occurs after a homokeratoplasty. In the first experiments of homokeratoplasty that I carried out, the graft had a rectangular shape, measuring 4 by 6 mm. in size. A flap similar in shape, although slightly smaller in length than the one described in the technique of autokeratoplasty, was located in the center of the cornea instead of the periphery; therefore there was less danger of anterior synechiae. However, this rectangular graft was soon given up and a quadrangular graft used because, among other things, the latter was kept more easily within the borders of the dilated pupil, and anterior synechiae, with their subsequent sequela, were less likely to occur. The cases in which an autotransplant can be performed are also the cases considered most favorable for homokeratoplasties when a suitable technique is followed. In these cases with corneal leucomas in the pupillary area and transparent cornea in the periphery, which are the only ones in which an autotransplant can be performed, my statistics reveal that over 90 percent of permanent transparencies with marked improvement of vision (sometimes from the ability to see hand movements to 20/15) may be expected when homokeratoplasties of the square-graft technique, already described, are performed. It is very doubtful that such good results can be obtained by the use of autokeratoplasties.

In 1936 Friede reported eight cases of partial penetrating autokeratoplasties, following the technique of Kraupa. The sizes of the grafts used by Friede were 6, 7, and 8 mm. in diameter. In the eight

eyes operated on by Friede, following this technique, the grafts remained clear in five, one became partially opaque, and the two remaining ones resulted in failure. The percentage of failures in the cases reported by Friede are too high to justify the performance of this type of operation in such cases, when excellent results may be expected if a suitable technique of homokeratoplasty is used.

Experimental work on animals' eyes, and a comparison of the results obtained in operating upon human eyes, showed that of the three methods—my homokeratoplasty, autokeratoplasty by transposition, and the round and rectangular autokeratoplasty by rotation—the first method gives by far the best permanent results. The methods of autokeratoplasty that have been described above, with their greater tendency to nebulosity and opacity of the graft, anterior synechiae, secondary glaucoma, and other complications, should be used only when it is not possible to obtain material for homotransplantation.

Source and Preservation of Donor's Material, with Remarks about Recent Publications Concerning the Use of Differently Preserved Donor's Corneas

When I started to perform keratoplasties on human beings, donor's material was obtained from patients with eye lesions requiring enucleation but with normal corneas. Very soon it was found out that this material was too scarce to take care of all the patients requiring keratoplasties. Occasionally, even when donor's material was available, a keratoplasty could not be performed because the patient requiring operation could not reach the hospital until several hours or days after the enucleation had been performed, and a practical way to preserve the enucleated eye in good condition was not known. The scarcity of donor's material and the difficulties inherent in its preservation raised two problems to be solved: first, the obtaining of more abundant donor's material, and, second, the preservation of this material in good condition for as long a period as possible. Eyes of the stillborn or eyes of infants who die shortly after delivery, as well as eyes of cadavers, were considered as sources from which donor's material might be obtained. In order to use such eyes, it was necessary to know: (a) How soon after delivery or death of the infant or adult it is necessary to enucleate the eyes, before cadaveric tissue changes begin to render the material useless. (b) The best way of preserving the enucleated eye for as long a period as possible.

To find a solution for both of these problems, experiments were carried out on rabbits' eyes. The eyes were observed clinically by inspection and with binocular loops, corneal microscope, and slit-lamp, and the ophthalmoscope. Then the eyes were fixed in formalin, imbedded in celloidin, and the clinical observations were completed with microscopic studies. Inspection of the eyes and observation with a binocular loop gave information concerning the luster of the epithelial surface of the cornea, the degree of transparency, and the gross changes in the corneal stroma. Observation with slit-lamp and corneal microscope revealed with more detail other corneal changes, such as edema of the epithelium, endothelium, and stroma, and changes in thickness due to swelling, and other causes. The ophthalmoscope was used to estimate the degree of transparency of the cornea as judged by the visibility of the details of the eye ground. The following experiments were performed: (1) Rabbits were killed and, with the eyelids closed, kept in the icebox at a temperature of from 1 to 2°C. above zero.

The eyes were examined every 12 hours for 144 hours. During the first 12 hours after the death of the animal, no appreciable cadaveric changes took place in the eyes, the cornea and the anterior segment of the eye appearing normal to inspection and slitlamp observation, and the fundus remaining clearly visible with the ophthalmoscope. Twenty-four hours after death, the cornea appeared dull and slightly turbid, due to desquamation of epithelial cells and slight haziness of the corneal stroma, as seen by inspection and with the aid of the corneal microscope. The ophthalmoscope permitted a good view of the eye ground, although the fine details were somewhat indistinct. Thirty-two hours after death, desquamation of the epithelium and haziness of the cornea had increased, and the ophthalmoscope, although still permitting a view of the eye ground, showed a more blurred picture. Forty-eight hours after death the epithelium was quite rough, the stroma more turbid, the eye ground still faintly visible, lens changes adding to the difficulty of observing the fundus. From then on, up to 144 hours after death, the haziness of the cornea increased gradually, making it more difficult to see clearly details of the iris and impossible to see the eye ground with the ophthalmoscope. At the same time that the cornea became hazy, the lens became cataractous, adding to the difficulty of seeing the fundus. Microscopic examination of these eyes fixed at different intervals failed to show any changes in the cornea during the first 12 hours after death. But from then on it was possible to observe degenerative changes in epithelium, endothelium, and parenchyma of the cornea, these degenerative changes increasing rapidly 48 hours after death of the animal. (2) Other rabbits were killed and mineral oil was instilled into the conjunctival sacs. The eyelids were closed, and the animals kept in the icebox at a temperature of 1 to 2°C. above zero. The course followed by these eyes was the same as that followed by the eyes in the first experiment. Apparently the instillation of mineral oil had no effect upon preservation of the corneal structures. (3) Other rabbits were killed and kept with their eyes closed at room temperature. Twelve hours after death the cornea already appeared dull and slightly hazy. From then on, changes took place as in the previous experiment, but more rapidly. (4) Eyes of the stillborn and eyes of infants who died shortly after delivery were enucleated at different intervals after delivery of the former or death of the latter, the material being kept in the ice box. These eyes seemed to follow the same course as that followed by the eyes of the rabbits in the first three experiments. If the eyes were enucleated 12 hours after delivery of the stillborn or after death of the infant, the cornea was in very good condition, as regards both inspection and examination with the corneal microscope and slitlamp. The fundi of these eyes could easily be seen with the ophthalmoscope. If enucleation was performed later than 12 hours after delivery of the stillborn or death of the infant, the cornea was more or less hazy, and it was more difficult to observe details of the eye ground.

In eyes of the stillborn the cornea had a tendency to become hazy at an early date, probably because of the longer interval following death of the organism. These observations led to the conclusion that in order to obtain corneal grafts from cadaver eyes with all the characteristics of normal corneas, it is necessary to enucleate the eyes within 12 hours after death, if the cadaver has been preserved at low temperatures (within a few degrees above freezing point). If the cadaver has been preserved at room temperature, autolysis of the corneal tissue

begins early, and in order to obtain healthy corneal grafts, enucleation must be performed within six to eight hours after death. Within 24 hours after death it is still possible to obtain good corneal grafts in eyes of cadavers preserved at low temperatures, but the epithelium, endothelium, and parenchyma have already undergone autolytic changes, making these eyes less desirable. It is not advisable to use grafts obtained from eyes of cadavers enucleated later than 24 hours after death, because of the more advanced corneal changes that may render the grafts nebulous or opaque.

The second group of experiments was undertaken to ascertain the best way to preserve donor's material after enucleation. (5) Eyes enucleated from rabbits immediately after death were placed in auto-serum, homo-serum, hetero-serum, in Ringer's solution, and in normal saline solution. The eyes were kept at a temperature of 2°C., and observed during a period of one month. All of these eyes that were placed in the various solutions followed the same course. For the first four days the cornea remained transparent, with the fundi clearly visible with the ophthalmoscope. On the fifth day, the cornea appeared hazy and the fundus more indistinct ophthalmoscopically. The haziness of the cornea gradually increased thereafter. Slitlamp and corneal microscope showed a normal-appearing cornea within the first four days. On the fifth day, the epithelium and endothelium began to appear edematous; the parenchyma, uniformly hazy, began to swell. Edema of the epithelium and endothelium, and swelling of the stroma, increased gradually thereafter. A microscopic study of these eyes failed to show any corneal changes during the first four days. Degenerative changes began to become apparent on the fifth day, increasing gradually thereafter. One striking feature of these corneas preserved in the various solutions was the tendency to become hydropic and swollen. In eyes preserved over three weeks these corneas became three times thicker than normal. (6) Eyes of rabbits enucleated immediately after the death of the animal were placed in a moist chamber at a temperature of 2°C. The corneas of these eyes, which were not bathed by any solution, remained transparent for nine days without any tendency to become swollen. After nine days a slight haziness developed, which increased gradually thereafter. These experiments proved that auto-, homo- and hetero-serum, Ringer's and normal saline solution were equally effective in preserving eyes. Since the last two were more easily obtained, they are to be preferred to the other three. A moist chamber preserves the cornea with a more normal appearance and for a longer period of time than does the immersion of the eye in different solutions; therefore this method of preservation is to be preferred when the operation is delayed for more than 24 hours. (7) Eyes of the stillborn, of infants, and of cadavers were preserved in normal saline solution and in a moist chamber. They behaved in the same manner as did the eyes of animals, with the exception that the cornea of the stillborn became hazy and swollen, if the eyes were immersed in some solution, much earlier than did eyes of infants and cadavers. Eyes of cadavers became soft by the second day, and, if preserved for three or more days, the cornea wrinkled and along these wrinkles hazy streaks appeared, making these eyes unsuitable for corneal transplantation if best results were to be obtained.

At the Institute of Ophthalmology, Columbia Presbyterian Medical Center, the following procedures are followed in regard to the obtention and preservation of donor's material. Eyes of the stillborn, of

infants who died shortly after delivery, or of cadavers are enucleated as soon as possible. The eyes are then thoroughly washed with normal saline and placed in a moist chamber. A test tube of large size, tightly closed with a rubber stopper, serves for this purpose. The eyes are then placed in the icebox at a temperature of about 1 or 2°C. The operation is scheduled to be performed as early as possible, either on the day of the enucleation, or preferably no later than 24 hours afterwards. If the graft is to be obtained from eyes of patients requiring enucleation on account of some ocular condition which leaves the cornea unimpaired, the procedure varies. If the operation is to be performed shortly after enucleation, the eyes are placed in normal saline solution until the graft is dissected. If the keratoplasty is not to be performed until about 24 hours later, the eyes are preserved in a moist chamber. Occasionally eyes with good corneas enucleated in some other city are sent to us to be used for corneal transplantation. The best method of sending these eyes is to surround them with cotton saturated in normal saline solution, placing them in a tightly-closed specimen bottle. The bottle is then placed in a metal container packed with ice. The eyes are sent by special delivery mail, if it will reach New York within a few hours. If coming from long distances, the eyes are sent by special delivery airmail. As soon as the eyes arrive, they are placed in a moist chamber at a temperature of from 1 to 2°C., and the operation is planned with a minimum of delay. Some of these eyes thus received have been found to retain the cornea in a condition suitable for transplantation.

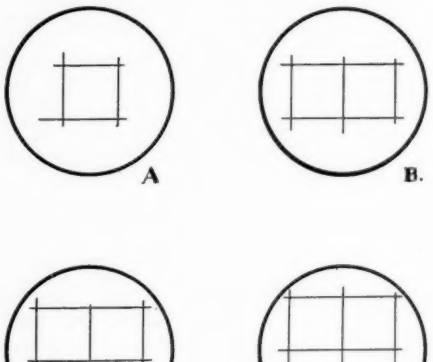

Fig. 12 (Castroviejo). Outlines illustrating method of obtaining one or more grafts from a single cornea.

Besides the multiplicity of sources employed at the Institute of Ophthalmology to obtain donor's material, it has been possible to operate upon a greater number of patients by obtaining several grafts from the same donor. Figure 12 illustrates the methods of obtaining with the aid of the double-bladed knife one, two, three, or four corneal transplants from the same donor. By utilization of all sources of donor's material that were available, and by obtaining more than one graft from each donor, it has been possible at the Institute of Ophthalmology to secure enough material to carry out keratoplasties on all the patients requiring this operation. Improvement in the technique of preserving donor's material has enabled surgeons to perform keratoplasty up to a relatively long time after the donor's material has been obtained. However, it should be emphasized that the fresher the material, the more likely to be successful are the results.

Recently reports have appeared in the literature in which it is stated that eyes of cadavers preserved at low temperature for different lengths of time have given better results in corneal transplantation than eyes of patients enucleated shortly before the performance of keratoplasty.[24a] In some of the reports, the theory is advanced that the chemical cadaveric changes are probably a favorable factor

for the successful healing and permanent transparency of the graft. I have carefully studied the result of corneal transplantation, using all sorts of donor's material, and found that in operating upon similar types of recipient eyes, best results are obtained when fresh material is used to obtain the graft. The fresher the material, the better the results. Grafts obtained from eyes of the stillborn, from infants, or cadavers will give as good results as grafts obtained from eyes enucleated shortly before the performance of the keratoplasty only when the cornea has not undergone changes detectable by clinical or microscopic observation. If the cornea shows signs of epithelial or endothelial edema, swelling of the stroma, or other cadaveric degenerative changes the results obtained, after operating both upon animals and human beings, have been in direct relation to the deterioration of the donor's material. The more deteriorated the material, the worse the result. The reports found in the literature, in which it is stated that cadaver eyes are better than fresh eyes for corneal transplantation, may be explained on the basis of either inaccurate observations or comparison of the results in eyes of recipients which did not have similar pathological conditions of the cornea. It is possible that the eyes operated upon with fresh donor's material were unfavorable, belonging to the group in which successful results occur in a low percentage, while the eyes operated upon with cadaver eyes may have belonged to the favorable group, in which a high percentage of successful results may be expected.

Another report recently published is the success of corneal transplants using corneas preserved in formalin.[24b] The authors of this report assume that the tissue of the donor is replaced by tissue of the host. I have made a microscopic study of the corneal grafts in eyes of animals, the time of observation varying from a few hours to two years after operation. From these microscopic observations, and from the clinical study of more than 400 keratoplasties in animals and more than 200 in humans, I have arrived at the conclusion that when the corneal graft remains transparent, it retains its individuality and preserves its own cellular elements. There is no evidence of a gradual replacement of this type of graft by the tissue of the host. If the epithelial cells of the graft have been damaged, they may be replaced by epithelial cells of the host. Also a new Descemet's membrane may be provided by the tissue of the host lining the inner surface of the graft without causing nebulosity; but any damage caused to the stroma of the transplant that needs to be repaired by tissue of the host is at the expense of permanent nebulosity or opacity. The reports in the literature in which it is stated that the tissue of the corneal graft is gradually replaced by the tissue of the host were most likely based upon the study of nebulous or opaque transplants. In this type of graft, there are to be found abnormal elements which are not found in a clear graft, leading to the conclusion that the graft tissue is replaced by the host tissue. I have performed a few keratoplasties upon eyes of animals with grafts obtained from eyes fixed in formalin. The experiments have been too few to draw definite conclusions except that the results obtained cannot be compared with those obtained when fresh material or material preserved without fixation has been used. The results obtained in operating upon human eyes with corneal grafts obtained from eyes fixed in formalin must be compared, over a reasonable period of time, with the results obtained when fresh material has been used for the grafts. Until then, it is premature to advocate the use of material fixed in formalin.

Report of instruments devised for keratoplasty

During the time that I had been interested in corneal transplantation, the following instruments were devised with the purpose of simplifying the technique and making it more accessible to the average surgeon. Figure 13 illustrates the instrument that was constructed by V. Mueller and Company in 1931, following my design. It consisted of a combination of keratome and scissorslike device. The keratome, with the spring closed, would enter the anterior chamber until its penetration was stopped by the bridge uniting the two parallel scissors. Then the spring was released, and a counterpuncture made with the keratome. Afterwards the spring was again closed, cutting a rectangular piece of cornea measuring 6 by 4 mm. The instrument was found unsatisfactory because it was difficult to make the puncture and counterpuncture parallel, with the result that grafts did not fit. The scissors had a tendency to stretch the corneal tissue, functioning with difficulty in normal corneas and with still more difficulty in scarred corneas.

Fig. 13 (Castroviejo). Special keratome and scissors.

In 1936 I had some correspondence with Dr. Francis I. Proctor regarding the development of a new instrument which would cut a circular beveled graft. Dr. Proctor was greatly interested in the problem of keratoplasty for the treatment of corneal opacities in trachomatous patients among the Indians of the Southwestern United States. Before we had the opportunity of discussing the construction of the new instrument, Dr. Proctor died. His nephew, H. Harrison Proctor, offered to finance, in memory of his uncle, a new instrument. The different specifications and a rough design of the instrument were submitted to Mr. John C. Lee, who worked out the mechanical problems of knives that would cut in a shelving manner. The instrument, made by Mr. J. F. Palmborg, was finished in June, 1937. Figure 14 shows the instrument, which has the following characteristics: A hollow tubular handle or casing (a), one end of which (h) is connected with a vacuum source. The other end (c) has a circular cup (j) at the lower extremity, which is to rest upon the cornea, and be fixed by suction. Inside of this cup is a thin screen to prevent excessive sucking of the cornea into the instrument. The hollow-handle unit is surrounded by a sleeve (b) with two arms (d) attached to

its lower end. These arms contain a knife (e) and a spring, which, pushing against the knives above, presses the lower end of the knife against a ring (g) located in the handle near the suction cup. This ring (g) preserves the point of the knives by preventing them from touching the margins of the suction cup. The knives are adjusted longitudinally within the arms by means of the screw (i) and are disposed at an oblique angle in reference to the axis of the instrument. The sleeve (b), containing the arms and the knives, rotates around the handle or casing (a), its longitudinal excursion affected by the rotation of the sleeve along the threaded portion around the handle. The excursion of the sleeve may be controlled by the screw (f). To use the instrument, the points of the knives are set at the same level as the suction cup. The end (h) of the handle is connected with the source of vacuum. The suction cup is applied against the cornea, where it is fixed by suction. The handle (a) is held with one hand, and the sleeve rotated clockwise in order to produce a downward projection of the knives. The knives, disposed at an oblique angle in reference to the axis of the instrument and kept always pressed against the ring (g) by the action of the spring near the suction cup, progress downwards and inwards, thus cutting the cornea in a shelving manner. This instrument was found ineffective, because the suction applied, which was around 70 cm. Hg, was not sufficient to hold the suction cup in position. The suction cup had a

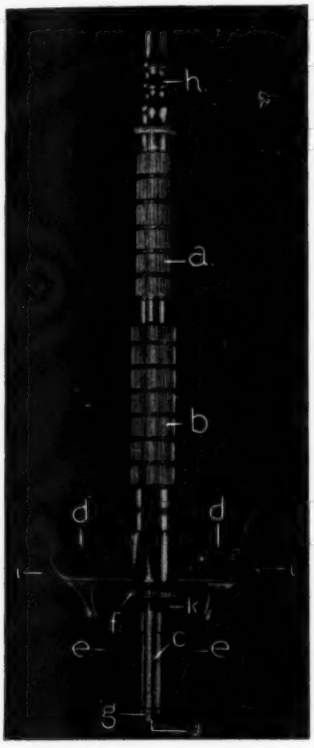

Fig. 14 (Castroviejo). Instrument to cut circular beveled graft (Proctor-Castroviejo).

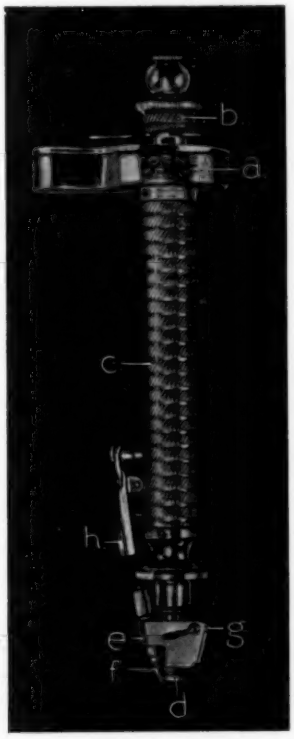

Fig. 15 (Castroviejo). Instrument to cut circular beveled graft (Longoria-Castroviejo).

tendency to slip sidewise, thus producing irregular incisions. Insufficient suction also caused the suction cup to slip off the cornea repeatedly, necessitating the reapplication of the instrument and readjustment of the blades as many times as the instrument became detached from the eye. With the aid of the instrument alone, it was not possible to complete dissection of the corneal disc. As soon as one of the knives entered the anterior chamber, the cornea collapsed and it was necessary to complete the incision with scissors.

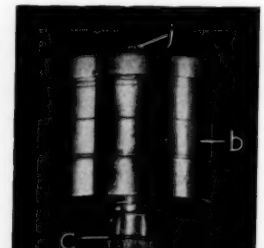

Fig. 16 (Castroviejo). Instrument to cut circular beveled graft (Longoria-Castroviejo).

In 1937 Dr. A. Longoria interpreted my ideas about a new instrument for corneal transplantation, with that illustrated in figure 15. This new instrument was an improvement over that illustrated in figure 14. It contains only one knife, instead of two, also with downward and inward excursion to cut the graft in a shelving manner. It also contains all the mechanisms of adjusting the knife and controlling the depth of penetration. The carrier (e) of the knife (f) is automatically driven by a hand-wound spring motor (a), which also acts as a source of vacuum. The rotation of the knife is governed by a push-button (h) that is readily available to the surgeon's hand. The advantage of this instrument over the one previously described is the automatic action, necessitating the use of only one hand instead of two to manipulate it. However, the disadvantages of this instrument are the same as those enumerated for the model of figure 14.

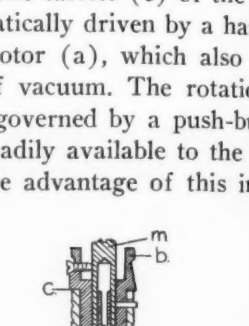

Fig. 17 (Castroviejo). Schematic drawing of details of instrument illustrated in figure 16.

In 1938 Dr. A. Longoria again carried out my ideas of a new instrument for keratoplasty, solved all the mechanical

problems, and constructed the instrument illustrated in figures 16 and 17. This instrument consists of two different units, which may be designated as the motor unit (b) and the cutter unit (a), detachable from each other at (c), so that the cutter and its associated members may be removed for purposes of sterilization.

The motor is of the spring type, hand-wound by a counterclockwise rotation. It provides the driving force for the cutter and is equipped with a push button (j) which, actuated by the surgeon's fingers, controls the rotation of the knife.

The cutter includes: (1) Adjustable legs (g) in the form of a tripod, the feet of which are provided with small prongs (h) adapted to rest upon the limbus, piercing the corneo-sclera slightly, avoiding slippage, and securing an excellent fixation of the instrument upon the eye. The legs are adjusted longitudinally and rotatably by means of nuts (fig. 17 j). (2) The handle or casing (a) carries within itself a shaft (fig. 17 l) connecting above with the motor and projecting below, where it is rigidly fastened to the carrier of the knife (d). (3) The knife itself (e) is disposed in the carrier at an oblique angle of 12 degrees in reference to the axis of the instrument, and is adjusted longitudinally within the carrier by means of a screw (f). A slotted, graduated opening permits predetermination of the depth of cut. (4) A pin (i), rigidly attached to a nut or collar, engages a threaded extension of the tripod (k), and, as it rotates, pushes the knife downward and inward, thus severing a beveled disc of cornea 4 mm. in diameter. The push-button of the motor unit is built in such a fashion that permits not only control of the rotation of the knife, but also the speed of this rotation. This instrument has been tried in animal eyes and found to perform quite satisfactorily, with the only objection that, having a single knife, the anterior chamber collapses as soon as the cornea is perforated, requiring the operator to finish the remaining uncut portion of the incision with the aid of scissors.

Dr. Longoria believes that it is possible to construct another instrument similar to the one just described, but provided with several knives, which would tend to perforate the cornea simultaneously, thus making a more complete incision. The high cost of this instrument might also be considered an objection. The instrument is so delicately constructed that, even standardizing its manufacture, the cost of one instrument might run into hundreds of dollars.

Instead of the spring mechanism just described to supply driving force to the cutter unit, this unit may be actuated by an external source of power through an electric motor, such as is used, for example, in the operation of a dental tool.

Dr. Longoria offers another modification of this instrument, in which the motor is eliminated and the cutter is operated by hand. The handle may be connected with a suction device which furnishes the vacuum necessary to fix the instrument on the cornea with the aid of a small suction cup.

At the beginning of my work on keratoplasty, a punch type of instrument to obtain a corneal graft and to dissect the leucoma of the host was considered. This idea was soon given up, because, in order to use the instrument, it was necessary to make an extra incision to introduce one portion of the instrument into the anterior chamber. Any incision in the eye of the host, besides the one performed for the dissection of the leucoma, is likely to favor accidents during and after the operation, and therefore must be considered as a complication to be avoided.

In view of the fact that experimental

and clinical work has demonstrated that a uniform beveling of the graft is not necessary, and the slight beveling of the inner layers of the host incision suffices, those surgeons favoring the circular type of graft may find the simple trephine illustrated in figure 8 quite satisfactory for all practical purposes.

Comment and summary

Corneal transplantation is a feasible and practicable surgical procedure when a suitable technique is employed. The operation can be mastered by the well-trained ophthalmologist, but requires a delicacy and accuracy of technique that can be attained only by practice. Before operating upon human eyes it is advisable for the surgeon to perform corneal transplantations in animals, rabbits being the most suitable. In this regard, individual adaptability to a special technique plays an important role. Those who have become acquainted with a certain operation may find it difficult to change to another technique giving good results in the hands of other colleagues. As in any other field of surgery, each technique has its advantages and disadvantages, and it is by extensive research made by many persons that one may state which technique gives the highest percentage of good results or which is specially suited for individual cases. Of all the published techniques of partial penetrating corneal transplantation, I believe that my method of the square corneal graft incorporates more advantages and fewer disadvantages than any other technique.

Autokeratoplasties will give as successful results as homokeratoplasties when the graft is obtained from the fellow eye. But autotransplantations by transposition or rotation give inferior results, and should be employed only when it is impossible to obtain material for homotransplantation.

Donor's material may be obtained from enucleated eyes with normal corneas, from the eyes of the stillborn, from infants dying shortly after birth, and from eyes of cadavers. These eyes should be as fresh as possible to prevent autolytic changes.

I discuss in detail the problem of preserving enucleated eyes in various solutions and in a moist chamber.

Four new instruments are reported and described only to indicate their inadequacies after clinical trial.

The writer desires to express his appreciation to Mrs. Elizabeth C. Proctor for her assistance in the form of a grant to carry out experimental work, to Mr. Harrison H. Poctor for financing one of the instruments, and to Mr. John C. Lee, Mr. J. F. Palmborg, and Dr. A. Longoria for their coöperation in devising instruments.

The author takes this opportunity to acknowledge with gratitude the assistance of the Department of Obstetrics of the Presbyterian Hospital, and of his colleagues of the Institute of Ophthalmology of the Presbyterian Hospital for their invaluable coöperation, without which this work could not have been undertaken and carried out.

The author further expresses his indebtedness to Dr. Charles A. Perera for his kind assistance in the editing of this and previous publications.

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THE SCREEN TEST AND ITS MODIFICATIONS, SCREEN-MADDOX ROD AND SCREEN COMITANCE*

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Any test to be practical must be accurate and readily applied in a large percentage of cases. It must be available in both office and clinic and to patients of all ages and degrees of intelligence. The screen test with its modifications fills these requirements better than any other test. Many tests are not applicable because the patient is too young to coöperate, or because of a degree of amblyopia with central scotomata that makes tests depending on central fixation impossible. However, when each eye, separately, can fixate a chosen object, the screen test can be accurately made in all cases. Among the tests limited by suppression, are: the phoromotor, Maddox rod, or, in fact, all of the tests that depend on dissimilar images, double vision, or fusion. These tests may be used in the phorias and lesser tropias, especially if paralytic, but even here their use is often limited and often do not show the true state of the muscle imbalance. They may in one case sufficiently relax the fusion impulse, while in another, the patient, by bringing his fusion into play, can greatly vary the findings. The fact that images are dissimilar does not necessarily discourage an attempt to fuse.

Commonly an exophoria by screen test is an esophoria by many of the other tests. This may be a valuable observation as it shows the examiner the patients' ability to overcome or to exaggerate the deviation. An esophoria may be considerably higher by many tests than by the screen test, which more completely breaks up the fusion and convergence impulse. It is often important to determine the difference in the amount of deviation as found by differing tests, as it shows the ability to vary a deviation under different conditions. This, however, is not done routinely. Again, when the amount of deviation is measured by the Priestley Smith tape, Hirschberg, and by other tests, depending on the corneal reflex, while the actual degree of squint may be accurately measured, the intimate details as obtained by the screen, and the screen-comitance test are entirely lacking. For example, a failure of abduction may be due to a paralysis of the external rectus or to an hypertense or fibrous internus. A study of secondary deviations and contractures, or the appearance of the conjunctiva at the insertion of the external rectus, when an attempt is made at abduction, will make the diagnosis more certain and the operative procedure more definite.

THE SCREEN TEST

The screen test is conducted as follows: The patient is directed to look at a spotlight, candle, or other definite object placed at a desired distance. In cases of amblyopia, the examiner must be certain that the patient is fixating centrally. This can be definitely determined by watching the eye when directed to fixate. The screen is moved from one eye to the other, the rate of movement depending on the promptness of the patient to change fixation to the opposite eye. The test object is usually placed at 20 feet and at 13 inches, but in certain cases it is often advisable to have either the distant object or the near object beyond or within the usual distance. The test is conducted in the same way no matter at what distance

* Read before the New York Society for Clinical Ophthalmology, March 4, 1940.

or in what position the test object is placed. An example of the importance of varying the distance is seen in cases of divergence excess. In this anomaly the exophoria is greater at 20 feet than at 13 inches, but it may still be an exophoria, while at some point beyond 20 feet the phoria often changes to an exotropia and may increase in amount, as the object becomes more remote. Again, in divergence paralysis and convergence spasms, the tests are of more value when made at 20 feet, 10 feet, 3 feet, 18 inches, and 6 inches, and refinements in diagnosis often depend on the amounts of deviation at these various distances.

When true orthophoria is present, the eye behind the screen does not deviate but remains in the position of fixation that it had when fixating with the fellow eye. When the screen is moved to the other eye, there is no movement of the eye that had been uncovered. This same lack of movement is observed when prisms, exactly correcting a deviation, are placed before the eyes. Any movement whatever will denote a deviation from true orthophoria.

In routine work, when the eye is seen to move to the left as the screen is moved from the right to the left eye, an exophoria or exotropia is present. One places a prism, base in, before either eye until the movement is reversed. A more complete relaxation is obtained when the screen is not removed as the test is continued, the prism being changed behind the screen. The prism should always be held in the symmetrical or posteronormal position, in which positions the readings are practically the same.

When the eye is seen to move out as the screen is moved from one eye to the other, one is dealing with an esophoria or an esotropia, in which case the prism is placed base out before either eye in strength sufficient to reverse the movement of the eye. If the right eye is seen to move down, the prism is placed base down before this eye or base up before the left eye. With square prism it is most convenient to correct a lateral and vertical deviation at the same time. For instance, if one is dealing with an exotropia combined with a right hypertropia, the prisms may be placed base in and base down before the right eye, or base in and base up before the left eye. The degree of deviation is between the prism which overcorrects the deviation and one which undercorrects it. For instance, an exophoria is undercorrected with 14$^{\Delta}$ prism, but overcorrected by a 16$^{\Delta}$ prism, the amount of the deviation is 15$^{\Delta}$. With experience one can often judge when the movement is just stopped, and the strength of this prism is the true measure of the deviation. Cases occur in which the readings will vary when the prisms are placed before the different eyes. This will be referred to later.

The screen test can be made as readily in the six cardinal fields and is a most important test in the diagnosis of muscle paresis, especially of slight amount. For convenience, the test in the six cardinal positions is made at from 15 to 18 inches. A further use of the screen test is to determine the fixating eye. This is done by directing the patient to fixate the test object when first one eye, and then the other is screened and unscreened. By this test one determines whether the condition is a phoria or a tropia; and, if a tropia, which eye is chosen for fixating. This test should be made for distance, near, and in the six cardinal fields, as the choice of the fixating eye may change for different distances or directions.

Occasionally, to correct a deviation, more prism is required when placed before one eye than when placed before the other. This is seen often in muscle paralysis and in postoperative cases, and de-

pends on both the amount of paralysis and on the amount of primary and secondary deviation.

When one eye fixates slowly while the fellow eye takes up fixation sharply, the slower-moving eye is paretic and the faster-moving eye does so because of the secondary deviation.

Precision in using the test may be acquired by using, as a patient, one who is practically orthophoric. A 10$^{\Delta}$ prism is placed, in turn, base out, in, up, and down, the observer noting the movement of the eyes. Smaller and smaller prisms are used, and when one can detect a change of movement with a 1$^{\Delta}$ prism, one's degree of accuracy is quite sufficient. A movement of redress is at times confusing. For example, in testing a convergent strabismus, when the prism is placed base out, the eye moves first out, and then in again. It means that the squint is still undercorrected and that the prisms should be increased until the first movement is in.

To correct a double hyperphoria or tropia, the lateral deviation, if any, should be corrected by a prism. This makes an otherwise doubtful hyperphoria very evident. Place first, a prism before the right eye, base in, for an exotropia, or out for an esotropia, which about corrects the lateral deviation. Add to this, a prism, base down, until the movement of the right eye is reversed, paying no attention to the fellow eye. This is repeated with the prisms before the left eye. This test may be used at 6 m., 33 cm., in the six cardinal fields, or in any position or distance that the usual screen test is used.

It is often found that, as the correction of a vertical deviation is made, the exophoria or esophoria (or tropias) will measure less than at first when the amount of lateral prism should be reduced. This often indicates to some extent how a surgical correction of the vertical squint will affect the lateral deviation.

The requisites for a successful use of the cover test are:

1. Central vision in each eye.
2. Sufficient light, preferably an indirect diffuse illumination, should be used—bright enough to enable the examiner to see the least movements of the eyes, but not so direct nor so glaring that the patient or observer is blinded by it.
3. The screen or cover should be large enough to cover an eye without undue attention to its position. The screens on the market are uniformly too small. The writer prefers a card 6 by 15 cm.
4. The screen should not be moved more rapidly than the uncovered eye can take up fixation.
5. Practice on the part of the examiner. The practice stated above will soon enable the examined to make the test both rapidly and accurately and to make most of the diagnoses without prisms, which are used only for accuracy in measuring the amount of deviation.
6. The square prism is most satisfactory, and the usual size about 4 cm. square is sufficient, although a larger one may have advantages. The round prisms are unsatisfactory, since they are hard to hold separately and impossible to hold in combination. The rotary prism cannot be used without a mathematical computation, which is time consuming.

Parallax test

The parallax test is a subjective test and so is dependent on the coöperation and observations of the patient. Some patients have no trouble in observing the movement of the test object, while others

are quite stupid about it; and this is often in inverse proportion to the amount of intelligence or education of the patient. It is a very delicate test when properly observed and again is quite tedious and valueless when complete coöperation is lacking. The writer uses it much less than formerly. The test is conducted at the same time as the screen test. As the examiner observes the eye moving, the patient is asked if he sees the test object move. When the eye reverses movement by the screen test, the patient should see the object reverse movement. For example, if the right eye diverges behind the screen, the eye is in a position to have a crossed diplopia and as the screen is moved to the left eye, the patient's eye moves to the left and picks up the object which has seemed to him to have moved to the left. This is termed a crossed parallax. An homonymous parallax is observed in an esophoria or esotropia; a right parallax in a right hyperphoria or tropia; and a left parallax when the left eye is higher. The test is extremely sensitive in many patients with a slight hyperphoria and is often observed in amounts less than 0.5$^{\Delta}$.

When the examiner sees the eye move in one direction while the object seems to the patient to move in the opposite direction, it is termed a perverse parallax. This is observed chiefly in postoperative convergent squints, and is due to faulty fixation or faulty projection. The test object should be flush with the background to prevent a normal parallax.

Screen-Maddox rod test

This test was described by Maddox in 1898, and by others since. It is a most delicate and valuable test in slight phorias and tropias.

The Maddox rod is placed before one eye and the patient asked to fixate a spot-light or candle. A screen is then placed before the rod to break up fusion further. When the screen is removed, a hyperphoria, for example, which had been present has increased. A prism is then placed behind the screen and before the rod, of sufficient strength to cause the image of the rod to pass through the light when the screen is first removed. The test may be used for esophoria and exophoria as well, but it is of especial value in hyperphorias. After testing hyperphorias as described above with the rod before the right eye, the rod should be placed, next, before the left eye. The findings may correspond exactly with that found when the rod is placed before the right eye. However, and not infrequently, when the rod is placed before the left eye, a left hyperphoria is observed, whereas a right hyperphoria was found with the rod before the right eye. One is now dealing with a double hyperphoria and careful measurements in the upper and lower corners will reveal a paresis of a pair of elevators or depressors—the same muscle in each eye being paretic. For example, while in the primary position, there was a 1$^{\Delta}$ of right hyperphoria when the rod was over the right eye, there was a left hyperphoria of 1$^{\Delta}$ with the rod before the left eye. A left hyperphoria of 3$^{\Delta}$ was found in eyes up and right, while in eyes up and left there was a right hyperphoria of 3$^{\Delta}$—other fields being normal there is proved a slight paresis of both superior recti, and the use of the screen-Maddox rod before each eye in turn was the means of finding it. Again, when the right hyperphoria so measured in the primary position is 2$^{\Delta}$ and the left hyperphoria is 3$^{\Delta}$, it will be found that the left hyperphoria in eyes up and right is greater than the right hyperphoria in eyes up and left, proving the right superior rectus to be the more paretic. Definite relief of symp-

toms may be obtained by prescribing the difference in amount—in this case, 1Δ. This is better placed before the eye showing the larger amount of hyperphoria.

Screen-comitance test

In the screen-comitance test, the screen is held in such a way that, while the patient sees the object with only one eye at a time, the examiner is observing the movements of both eyes. This test should be made in the six cardinal positions and may be made at the same time as the screen test, but is better made as a separate observation.

When making the test with the sound eye fixating, the paretic eye is seen to lag (primary deviation); when fixating with the paretic eye and putting into it the added impulse necessary to fixate the object in the normal field of the paretic muscle, the associate or yoke muscle of the other eye receives the same added impulse and overshoots. This is termed secondary deviation and is always greater than the primary deviation. Usually the more the paresis, the greater the secondary deviation. In extreme cases this is not so, since the muscle is so paralyzed that fixation is not attempted and hence the secondary deviation is correspondingly small.

The screen test with its modifications has been criticized because of inaccuracies, length of time necessary to make the tests, and for other objections. These criticism, however, only prove a lack of acquaintance in interpreting the test and a lack of dexterity in making them. A small amount of practice and careful observation will amply repay the examiner and will give a keener appreciation of the variations in motor anomalies than is obtained through any other means.

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A CASE OF CORNEAL ULCER ASSOCIATED WITH LYMPHOGRANULOMA VENEREUM*

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The association of lymphogranuloma venereum and corneal ulcer is unusual. Hence a case presenting these conditions is reported and discussed.

Lymphogranuloma venereum is a chronic venereal disease caused by a filterable virus, and characterized by the development of an inconspicuous primary sore followed shortly by a regional adenopathy. In the male, inguinal-bubo formation results, and softening and breaking down of the glands may occur. In the female, pelvic adenopathy leads often to rectal stricture and perirectal fistulous lesions following suppuration and discharging of the enlarged regional lymph nodes.

Systemic disturbances occur due to the dissemination of the virus. These include meningitic and encephalitic disorders, nasopharyngeal and glossal ulceration, pulmonary involvement, skin lesions, arthritis, and many others. Ocular lesions, too, have been reported, and the case herewith presented illustrates this complication.

The diagnosis of lymphogranuloma venereum depends upon the history and finding of the characteristic inguinal or pelvic adenopathy together with a positive Frei test. This consists of an intracutaneous injection of material derived from the bubo of a proved case. If the test be positive there will occur an area of redness and edema about the site of the infection reaching its height in 48 hours. The diagnosis, too, is confirmed by animal inoculation with the virus, which is followed by the development of the characteristic pathologic picture.

Case report

Mrs. S. P., colored, 29 years of age, was referred to the Eye Dispensary by the Proctologic Department of the University Hospital on August 25, 1939, because of redness and soreness of the right eye for a period of three weeks.

Her past medical history was irrelevant except for the following facts: She had undergone a hemorrhoidectomy in March, 1935. Shortly thereafter a rectal stricture developed with constipation, accompanied by discharge of blood and mucus. On December 3, 1937, the patient reported to the Proctologic Department where a diagnosis of lymphogranuloma venereum was made.

Examination of eyes: Vision was O.D. 6/9−2; O.S. 6/6−3. The muscle balance, tension to fingers, and pupillary reflexes were normal in each eye. The left eye was completely normal in every respect externally and ophthalmoscopically. The interesting finding was in the right eye, the upper lid of which was slightly swollen. There was a slight general conjunctival flush somewhat greater over the upper tarsal, retrotarsal, and upper limbal regions corresponding to the position of a corneal ulcer. There was a slight ciliary flush somewhat enhanced at the site of the ulcer. The ulcer was narrow (1 mm.), long (6 mm.), and crescentic; 1 mm. inside of and paralleling the limbus, extending from the 10- to the 1-o'clock position. The central or inner edge of the ulcer

* From the Department of Ophthalmology of the Hospital of the University of Pennsylvania. Presented at the College of Physicians of Philadelphia, January 18, 1940. The discussion of this paper is called to the reader's attention.

stained with fluorescein, the floor was smooth and gray, and the outer border was overhung by a very unusual roll of pannuslike tissue, pink and vascularized. By slitlamp examination, the lesion was seen to be superficial, the deeper layers of the cornea being clear. There were no K.P., no anterior-chamber floaters, and the anterior segment revealed no pathology other than the ulcer noted.

Ophthalmoscopic examination of the right eye revealed no pathology.

A diagnosis of simple marginal ulcer was made in spite of its unusual character. We feared, however, that features might develop which would justify a diagnosis of Mooren's ulcer.

Treatment: Admission to the hospital was recommended but refused, so home treatment was instituted: atropine, hot compresses, salicylates, mercurophen wash, and like medication.

Studies: Wassermann and Kahn reactions were negative. Smear and culture of the ulcer base revealed only a few diphtheroids, which we thought had no etiologic importance. A quantitative Mantoux test with P.P.D. was negative in dilutions up to and including .001 mg.

Progress: The conservative treatment instituted did not prove adequate. The lesion progressed in a slow, inexorable manner, advancing little by little toward the center of the cornea, the advancing edge persistently staining. Admission for treatment was steadily declined, in spite of our repeated urgings, for we felt more and more inclined to the diagnosis of Mooren's ulcer. Cauterizing agents—phenol, trichloracetic acid, iodine—were employed with no improvement.

After two weeks of ineffectual treatment with steady progression in the ulcer, one of our colleagues suggested, because of the patient's history, that a Frei test should be made. It was found to be positive, establishing the fact that the patient had lymphogranuloma venereum. Could the eye lesion be an expression of this viral disease? We had read some favorable reports of the good effects following the use of sulphanilamide in the treatment of lymphogranuloma venereum[1, 2, 3] and determined to try it. Ten grains thrice daily by mouth were given with good results, for the lesion ceased to progress, and the pannuslike roll or epaulet of tissue flattened and disappeared, staining ceased, and complete healing occurred in two weeks. We considered the effect striking in view of the depressing, dangerous progress of the ulcer throughout five weeks, unaffected by intensive therapy during the last two weeks.

Discussion

Though we can find no reports of corneal ulcer associated with lymphogranuloma venereum, there are many reports of other associated ocular lesions.

Experimentally induced in animals, von Haam and Hartwell,[4] in 1936, reported the occurrence of acute hemorrhagic or purulent conjunctivitis after intracerebral inoculations of the virus of lymphogranuloma venereum. It signified to them a successful implant of the virus and was usually followed by a fatal meningoencephalitis.

Parinaud's syndrome has occurred in association with lymphogranuloma venereum. Levaditi, Bollack, Basch, and Devignes[5] reported in 1936 a case of Parinaud's syndrome; conjunctivitis with preauricular and submaxillary adenopathy, due to the virus of lymphogranuloma venereum. No fever and relatively little discomfort occurred. A positive Frei test indicated the cause, and the virus was recovered from the lesion. Three cases of Parinaud's syndrome were reported by Hashimoto and Tamata[6] in 1938 caused by inguinal buboes. All, curiously enough, were on the left side with ipsilateral

adenopathies. The evolution of the disease was slow but the adenopathies healed readily.

D. J. Ouwejan[1] reported three cases in which the diagnosis depended on a positive Frei test. Fuadin (sodium antimony biscatechol disulfonate of sodium) and sulphanilamide induced a rapid cure of his cases.

Applemans[7] reported a case in which a young woman doctor, while working in the laboratory with the virus of lymphogranuloma venereum, developed a case of Parinaud's conjunctivitis.

However, no record was found of corneal ulcer associated with lymphogranuloma venereum. It is not claimed that the ulcer has been proved to be due to this disease, for final proof would depend not only on a positive Frei test but on biopsy studies and the successful recovery of the virus with confirmatory inoculation experiments. These latter studies have not been made. Furthermore, the successful use of sulphanilamide advocated in the treatment of lymphogranuloma venereum furnishes some additional evidence of the etiologic relationship of this disease. It is acknowledged that this study is inadequate, and that proof is far from final that this corneal ulcer was due to lymphogranuloma venereum, but the case it reported because of the interesting association and in the hope that future observers may be more alert to prove that the virus of lymphogranuloma venereum may cause corneal ulcers.

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PSEUDOGLIOMA OF THE RETINA

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Pseudoglioma is an inclusive term applied to several disease conditions of childhood which have in common a single symptom; namely, reflection of light from within a sightless eye. This phenomenon was first described in the literature in 1817 by the Viennese physician Beer,[1] who wrote: "Such an eye shines in a dim light with a reddish or yellowish reflection, but only in certain positions of the eyeball, and hence has a certain resemblance to a cat's eye." In 1790 Richter[2] had described the intraocular picture associated with this reflex, as follows: "Sometimes the interior of the eye, at a distance behind the pupil, appears white. One sees a concave white surface on which blood vessels can be distinguished. It seems that this is at first cloudy and dull but finally a quite white color, deep in the eye, comes from the retina, which in this case has lost its natural transparency." Beer also noted "very delicate vessels" on an "opaline ground."

For many years this reflex, which became known as amaurotic cat's eye, was regarded as pathognomonic of glioma of the retina. But among eyes removed for glioma, here and there would be found one which failed to show a neoplasm when the specimen was examined. Furthermore, the pathologic pictures of these eyes which simulated glioma clinically but in which no gliomatous tissue was present differed among themselves. It thus became evident that not one, but a number of morbid states could be responsible for the peculiar phenomenon.

The conditions for production of amaurotic cat's eye are transparency of the cornea, aqueous humor, and lens, and the presence within the vitreous chamber, close behind the lens, of a substance having a white or clear colored surface that is capable of reflecting the light entering through the pupil. This substance may be a tumor or tuberculoma, the detached retina, an inflammatory exudate, an organized hemorrhage, hyperplasia of the retinal neuroglia, a fibrous organization of the vitreous humor, a congenital anomaly, or fetal remains. Most often it is the retina that provides the reflecting surface by protruding into the vitreous chamber, either in the form of retinal tumor or because of detachment from the choroid. The reflecting retinal surface may be healthy in appearance, as in glioma exophytum and certain cases of metastatic ophthalmia, and other conditions, or it may be degenerated or infiltrated by new-formed masses.

ETIOLOGY AND PATHOGENESIS OF PSEUDOGLIOMA

The most frequent cause of pseudoglioma is one of the common *acute infections diseases of childhood,* such as measles, scarlet fever, whooping cough, and, especially, cerebrospinal meningitis, and gastro-intestinal infections including food poisoning. Although most infectious diseases can give rise to metastatic ophthalmia, not every infectious embolus lodging in the eye of a young child leads to a pseudoglioma. According to Curtil,[3] to produce this clinical picture the metastasis must be either in the choroid, resulting in exudative choroiditis, or in the anterior part of the uveal tract, resulting in iridocyclitis. Each of these two conditions has as essential character a benign, slow evolution, lacking intense phenomena of reaction, a mode of development which also characterizes glioma.

Cerebrospinal meningitis may infect

the choroid by a more direct route—along the sheath of the optic nerve. On the cadaver Percival[4] was able to demonstrate that fluid injected into the sheath of the optic nerve behind the optic foramen travels under the sheath directly to the choroid in children under five years of age, whereas in adults the fluid meets with a block either at the optic foramen or at the scleral opening. He infers therefrom that pseudoglioma, retrobulbar neuritis, and choked disc may all arise from the same condition, the result in the individual case depending on the anatomic peculiarity present. In a two-year-old child, said to be recovering from tuberculous meningitis, he saw pseudoglioma in one eye and retrobulbar neuritis in the other.

Pathologic organisms may or may not be demonstrable in the exudate. In most cases of pseudoglioma (from whatever cause) the retina is found detached. Detachment may be caused by accumulation of fluid between the retina and choroid, or between the layers of the choroid resulting in separation of the inner choroidal layer together with the retina. When the exudate is in the vitreous chamber, its organization and shrinkage with resultant inward pull on the retina are responsible for the detachment. A similar mechanism is in play when the infection results in fibrous organization and shrinkage of the vitreous humor or of hemorrhage in the vitreous chamber.

In cases reported by Gourfein-Welt[5] and by Zeeman[6] a general infectious disease (whooping cough and "mild sepsis," respectively) was believed to have produced a pseudoglioma through hemorrhage rather than through the mechanism of metastatic ophthalmia, the hemorrhage resulting from paroxysmal cough in the one case and from thrombosis in the other.

Tuberculosis and, much more rarely, congenital syphilis can give rise to inflammatory processes and granulation-tissue proliferation which simulate glioma. According to Lloyd,[7] the type of tuberculous disease most likely to confuse the diagnosis is that which produces a fungoid mass behind the lens. Curtil[3] states that tuberculomas may be located anteriorly (in tuberculous iridocyclitis) or posteriorly (in tuberculous choroiditis) and that in either localization they may give rise to the clinical picture of pseudoglioma. In adults tuberculosis in these regions of the eye takes the disseminated, miliary form, the tumor-bearing type is peculiar to children and young persons (Jacoby[8]). Bedell[9] speaks of a tuberculous periphlebitis of the retina producing the picture of pseudoglioma through hemorrhage.

Glioma may be simulated by *traumatic intraocular hemorrhage* occurring during birth or after birth. If sufficient time has elapsed since the hemorrhage, the histologic picture will show substitution by connective tissue. Reese[10] saw three cases in which a yellowish or grayish-white mass protruding from the retina in a child was shown to be due to organization of hemorrhage. The primary site of the hemorrhages seemed to be the external plexiform layer of the retina, which is the layer in which the retinal vessels terminate. From here the blood would tend to spread out in the outer layers of the retina and into the subretinal space. The gradual contraction of the fibrous tissue of the organized hemorrhage produced the illusion of a progressing tumor by pulling more and more of the retina into the lesion, which strengthened the suspicion of glioma. Hamma[11] tells of "a picture very similar to amaurotic cat's eye" which followed a blow to the eye with hemorrhage into the vitreous and Tenon's capsule.

A congenital pseudoglioma may be the result of *detachment of the retina* caused

by hemorrhage from birth trauma or by an intrauterine inflammatory process. Heine[12] cites from the literature a case of a child in whom both eyes were enucleated at five months for glioma, but retinal detachment, the same in each eye, was the only finding in the specimen. Photophobia had been noted immediately after birth and, soon after, a bright reflex from each eye. The few cases on record of hereditary or familial detachment of the retina have in general shown pseudoglioma. Simple detachment of the retina is said to be rare in children. In his thesis prepared in 1910 Curtil[3] was able to record only four such cases which had been diagnosed as glioma and a fifth case which was correctly diagnosed.

Congenital malformation and *fetal remains* are not infrequent causes of pseudoglioma, and this type is probably the easiest to recognize. The affected eye is often smaller than its fellow and this and other anomalies may point the way to the correct diagnosis. Among such simulants of glioma may be mentioned hypertrophied remains of the vascular envelop that encloses and nourishes the fetal lens. These have been found applied to the posterior surface of the lens "like the backing of a mirror" (Lloyd[7]) together with persistence of the hyaloid artery.

Coats's retinitis exudativa externa and von Hippel's angiomatosis retinae are rare affections which may give rise to the picture of pseudoglioma. A third condition, gliosis of retina, might also give cause for clinical confusion with glioma. The interrelations between these conditions, if existent, are not clearly determined. Coasts's retinitis is said to occur only in males and to be always unilateral. Persons attacked may be otherwise healthy; that is, the condition is not a recognized sequel of any general or ocular disease. Von Hippel[13] believes that etiologically Coats's retinitis is not a single process. The changes in the retina are characterized in fresh cases by vascular changes of aneurysmatic type, copious serofibrinous exudation, hemorrhages, and focal necroses, and in older cases by glial proliferations and circumscribed areas of new-connective-tissue formation between the retina and choroid, suggestive of neoplasm and explained by organization of the hemorrhages. Scheerer[14] states that it is not yet known whether vascular changes or exudative foci are primary; Coats held the primary change to be vascular; Leber, on the other hand, believes the hemorrhages to be secondary and maintains that the necrotic processes represent the essential fact of the disease; while von Hippel holds the disease to be a true inflammatory process. Externally there is no inflammation. The onset and course are insidious, with slowly developing white exudation or infiltration behind the retinal vessels. According to Lloyd,[7] the large "woolly" exudates between the retina and the choroid, if placed well forward, may show plainly through the pupil. But the condition is rarely discovered before it has progressed to total blindness from retinal detachment, glaucoma, iridocyclitis, or cataract. Retinal detachment is likely to be incomplete owing to the presence of zones of chorioretinal adhesions. A characteristic feature of the histologic picture, according to Jacoby,[8] is massive desquamation of pigment epithelial cells transformed to fatty granular cells. Coats's retinitis occurs in both adults and children.

Von Hippel's angiomatosis retinae is seen in children less than 14 years of age, shows a preference for the male sex, and is frequently bilateral (Scheerer[14]). It received its name from nodules present on the vessels, but the histologic picture may be dominated by proliferation of glia. The retina degenerates secondarily.

Symptoms

The only constant symptoms of pseudoglioma are the two which it shares with true glioma, blindness and reflection of light—sometimes described as glare—from the blind eye. Both symptoms are usually chance discoveries by the parents. Sometimes the blindness is discovered on a routine examination when the child enters school. At other times a parent, startled by the first view of the shining eye—"like a cat's"—inquires into the sight and learns for the first time that his child is blind in one eye. Like the blindness, the light reflex may be present for an indeterminate time before it is noticed, since it is not visible in full daylight unless especially sought for, and in most cases the light, in order to be reflected, must strike the eye at a certain angle. The color of the reflex may be milky white, grayish white, yellowish white, bright yellow, or reddish. It is sometimes described as metallic or brassy. It is rare for an ophthalmologist to see a case of pseudoglioma before the blindness and the light reflex are fully established.

In many cases there are no warning symptoms. A metastatic ophthalmia may run a wholly silent course, and the primary infectious disease may have been so mild as to give rise to no recognized nor remembered symptoms. This seems to be particularly true of meningitis (Coats and Forbes,[15] Lewis[16]). In a certain percentage of cases the physician is told that the eye "always gave trouble" or "was never quite right" since the child had had such-and-such an infectious illness. This goes on for months or years and then suddenly it is found that the eye is blind. Acute prodromal symptoms, when present, may be referable to the eye itself—redness, pain, photophobia—or they may be such as might point to the brain—headache, vomiting, convulsions. In Lewis's[17] case a three-months-old child was reported to have suffered with the right eye for three months, when, one night, sharp pain developed and next morning the eyeball was red and swollen. Several months later a gray mass filled the pupil and the eye was blind.

Eye findings

When first seen by the ophthalmologist, the eye is usually normal in external appearance, except that there may be convergent or divergent strabismus. The movements of the eyeball may or may not be free. The pupil does not react to light. In some cases it is dilated and in others it is contracted and cannot be dilated by a mydriatic because of adhesions of the pupillary margins. Further examination with the loupe and ophthalmoscope may show traces of past inflammation, or all such may be lacking. The iris may appear inflamed, atrophic, or normal. Gallemaerts[18] described a case of bilateral, probably congenital, pseudoglioma with ectropion of the uvea which partitioned the iris into segments by black elongated wedges with base on the pupillary border. He stated that ectropion of the uvea is one of the manifestations of false glioma, but his case seems to be unique in the literature. The anterior chamber is likely to be shallow and may be obliterated. In the pupillary field a detached retina may be visible as well as the pseudoneoplasm.

The finding of chief interest is the mass in the vitreous chamber. The mass is visible with the naked eye on oblique lighting and often on direct lighting. It may be conveniently examined with the loupe while strong light is projected into the dilated pupil from the side. It has been stated that the aspect of this mass depends on the nature of the substance of which it is formed. But the data on this head in the literature are scanty and contradictory. We must await much fuller and more definite information before we can safely

use the appearance of the mass itself in an etiologic diagnosis, except—and even here with reserve—in the case of certain congenital malformations or fetal remains. In the latter it is sometimes possible to catch a glimpse of the persisting hyaloid artery or of the central canal of the vitreous (Stilling's canal) through which, in the fetus, this artery runs from the central artery of the retina to the lens capsule. Lloyd[7] stated that remains of the hyaloid artery are probably present to some extent in all persons; difficulty will arise only when there is a still-functioning connection with the lens through a remnant of the fetal vascular tunic. In this remnant, which appears as a splotch of white tissue on the posterior surface of the lens, functioning vessels may be visible to the naked eye through the enlarged pupil. This picture, in Lloyd's opinion, is not too complex for diagnosis unless inflammation or retinal detachment is added.

In other types of pseudoglioma the mass appears to spring from the base of the eye and approaches closely to the lens. It is likely to be concave anteriorly. It usually appears as a single, compact, homogeneous mass with smooth surface. It may or may not appear vascularized. The color of the mass may be white, gray, yellow, reddish, or green; the white is sometimes described as "clear" and the yellow as "brilliant," but the epithet "dirty" is also frequently applied; rarely, the mass has been described as violaceous—white, gray, and yellow are the most common colors. The statement has been made that a pseudoglioma from organized hemorrhage has a reddish color when viewed through the pupil, but, on the whole, evidence is lacking that would connect any special etiology with any special color of the reflex or of the mass behind the lens, with the exception of the fetal remains plastered on the lens, which in the reports I have seen were always described as white. In the five cases of pseudoglioma from simple detachment of the retina, collected by Curtil,[3] the reflexes were described as white, brilliant yellow, bright gray, whitish gray, and green, respectively.

It used to be said that hypotension of the eyeball distinguished pseudoglioma just as hypertension distinguished true glioma of the retina and that we had here a definite point on which to make the differentiation. More experience has shown that the intraocular pressure may be increased in pseudoglioma and decreased in glioma, although more often the globe is soft in the former and hard in the latter. The usual course of pseudoglioma is toward atrophy of the eyeball, from nutritional disturbances. It is not so much the intrusion of the mass on the space of the vitreous chamber that causes increase of intraocular pressure in glioma, since, according to Fuchs,[19] there is a corresponding decrease in the vitreous humor. In a case seen by Guglianetti[19] there was hypotension with the glioma occupying as much as three quarters of the vitreous chamber. Hypertension in glioma results rather, according to Curtil,[3] from compressive and obstructive changes at the site of the angle of the anterior chamber which take place before the tumor itself has grown large enough to reach the angle. Changes tending to occlude the angle of the anterior chamber and compress Schlemm's canal can take place in pseudoglioma also and in such cases the stage is set for the development of glaucoma. Montalti[20] mentioned a case in which the anterior chamber was filled to the periphery with hyaline exudate, which also occluded the canal of Schlemm and part of the iridocorneal angle. Owing to the elasticity of the sclera in children, intraocular hypertension takes a certain time to become established and give rise

to the symptoms of glaucoma. The conditions which must, in the end, inevitably produce glaucoma may be present long before there are any clinical manifestations.

Differential Diagnosis from Glioma

Painstaking efforts have been made to discover the bases for a dependable clinical differentiation between glioma and pseudoglioma in the color of the reflex, the aspect of the mass and adjacent structures, tension of the eyeball, history of a preceding infectious illness, and so forth, but the exceptions swamp the rule, and the differential diagnosis may still offer insuperable difficulties. Even though permanently blind, the eye performs a valuable function in the young child in helping to mold the bony orbit, but unless diagnosis of pseudoglioma can be placed beyond reasonable doubt, this is not a sufficient reason for withholding operation. It is far better to enucleate on a wrong diagnosis than to let a glioma develop without intervention.

Efforts to make use of the color of the reflex in the differential diagnosis appear to rest on no solid foundation. The age factor becomes important after the fifth year of life. Glioma is distinctly a tumor of infancy and early childhood. The greatest number of cases are seen in children under three years of age. After the age of five years it begins to be rare and after the age of seven it is exceptional. With every year after the fifth the chances are increasingly in favor of pseudoglioma as against glioma. A positive history of an infectious illness, food poisoning, or other gastro-intestinal infection at the time or a few months before the reflex from the eye was first noticed is strong presumptive evidence for pseudoglioma, but absence of such a history proves nothing. If the eye is injected when first seen by the physician, or if there is a history of redness, photophobia, or pain in the eye around the time when the reflex was discovered, the lesion is most probably a pseudoglioma, but here again no importance attaches to the absence of such manifestations of inflammation. Long continuance of the condition without change speaks for pseudoglioma, but Reese's[10] case, mentioned above, shows that it is possible for a pseudoglioma to give the appearance of a progressing tumor.

The aspect of the tumor or pseudotumor is of some value in the differential diagnosis. Terrien[21] found that in pseudoglioma the lesion is located farther toward the front than in glioma, especially in the earlier stages of the latter. Pseudoglioma is said to present on inspection through the pupil a more regular and compact mass with smoother surface. In glioma the mass is likely to be nodular, with roughened edges, and the surface to be grooved by blood vessels. Newly formed vessels are present in the fully developed glioma and absent in pseudoglioma, and in the latter the retinal vessels are less likely to be visible than in the former.

Iritis, exudates in the pupillary space, and such traces of past inflammation as synechiae give, perhaps, the best assurance that the mass is of inflammatory and not of neoplastic origin. But, although glioma does not cause inflammation of the eye, long-standing glaucoma may produce changes analogous to those of inflammation. On the other hand, not all pseudogliomas give rise to inflammatory manifestations. The tonus of the eyeball deserves consideration in the differential diagnosis, but one must bear in mind that the tension may, in fact, be normal or altered in either direction in either condition, though it is more usual for it to be subnormal in pseudoglioma. Recently the X ray has become recog-

nized as able to afford valuable evidence for differentiation in many doubtful cases. Mottled shadows of calcium density may be seen in most cases of glioma and are absent in pseudoglioma.

Pathology

The pathologic picture presented by the enucleated globe varies with the condition that gave rise to the pseudoglioma. With pseudoglioma consequent on metastatic ophthalmia, which is believed to be the most frequent etiology, the inflammatory character of the basic condition is imprinted on the entire eyeball. Degeneration and necrosis are more or less widespread and advanced. In cases based on exudative choroiditis, Curtil[3] found the most prominent lesions to be in the choroid, especially in the anterior part. In cases based on iridocyclitis, he found exudative masses forming behind the lens and traces of inflammation more prominent in the anterior segment of the eyeball than in choroiditis, making the diagnosis easier. The tendency in the various types of pseudoglioma is toward atrophy. Glial proliferation is a feature of Coats's retinitis exudativa externa and of von Hippel's angiomatosis retinae.

I had recently the unusual opportunity of following a case of pseudoglioma from a time prior to the appearance of the mass in the vitreous cavity.

Case history

C. W., a three-year-old girl, was brought to me on March 27, 1936, because of convergent strabismus of the left eye. The birth history was normal. At the age of six months it was noticed that the child's left eye was beginning to turn inward. The parents had been informed that the eye would eventually become straight as the child grew older, but since it appeared to be getting worse they now sought advice.

Examination. Visual acuity: R.E. 6/7.5 minus 4; L.E. 2/60 blurred. The patient fixated with the right eye while the left eye was convergent 32 degrees on the Schweiggert perimeter. There was definite limitation of the extraocular excursions to the left; the eye could not be drawn to the outer canthus. Excursions upward showed a pronounced weakness of the left inferior oblique.

Ophthalmoscopic examination. There were no significant findings in the right eye. The left eye showed a large central chorioretinal defect involving the entire macula. No other areas of chorioretinitis were seen.

Campimetric studies revealed a large absolute scotoma in the left eye.

Refraction. With R.E. +2.50 D.sph. ⊂⊃ +1.25 D.cyl. ax. 102.5° vision was 6/6; with L.E. +2.25 D.sph. ⊂⊃ +1.50 D.cyl. ax. 85° vision was unimproved.

Laboratory data. Serologic study of the blood was negative. Repeated tuberculin tests were negative. Radiographic study of the chest yielded no demonstrable evidence of tuberculosis. The urine was negative.

Subsequent history. The patient was seen again on August 28, 1937, with no particular complaint referable to her eyes. Ophthalmoscopic examination of the right eye was essentially negative; examination of the left eye showed the central chorioretinal lesion to be quiet and apparently well walled-off.

On June 24, 1939, the patient returned. The mother stated that "three days before consultation the child did not feel well and since that time the left eye had been painful. The child was unable to take food without vomiting immediately after." Examination showed the child to be acutely ill.

The cornea of the left eye was somewhat hazy, the pupil was widely dilated,

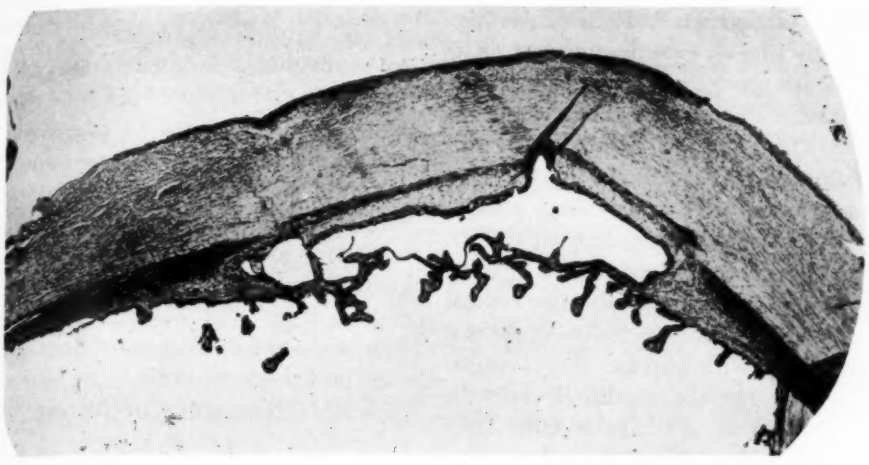

Fig. 1 (Wetzel). Shows a thickening of the corneal epithelium with an irregularity of Bowman's membrane. Newly formed blood vessels are found throughout the substantia propria. Lymphocytes and fibroblasts are found adjacent to corneal connective-tissue stroma. Fibrous adhesions extend between the cornea and iris at several points.

and the vitreous turbid. There was a grayish-green mass in the vitreous, extending well out to the posterior surface of the lens. There was evidence of recent hemorrhage; the retina was partially detached; tension, R.E. 19 mm., L.E. 86 mm. Hg (Schiötz).

Radiographic studies revealed no calcium deposits in the mass.

A diagnosis of pseudoglioma was made. The eye was removed.

Pathologic report. Moderate atrophy of the cornea; atrophy of the iris and ciliary body. Gliosis and proliferation of the retina and choroid. Recent and old hemorrhages into retina and choroid (figs. 1 and 2). Moderate atrophy and excavation of the nerve head. Secondary glaucoma. No malignancy. Diagnosis: Pseudoglioma; secondary glaucoma.

Comment. This case is, so far as I have been able to discover, unique in the

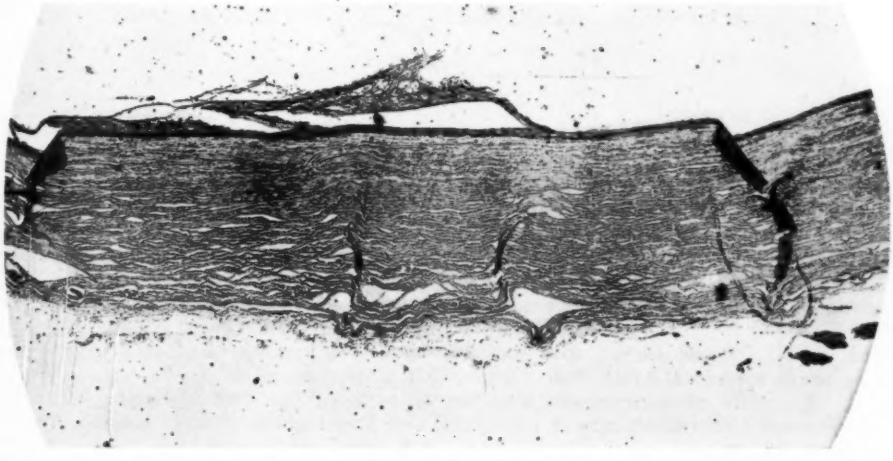

Fig. 2 (Wetzel). Shows well-advanced gliosis and proliferation of the detached retina with vacuolization and degenerative changes. Sclera shows connective-tissue hyalinization.

literature in that we have an ocular history, with fundus examinations, stretching back for more than three years before the mass in the vitreous was first observed. The child was brought for examination on account of a long-standing but now apparently progressing strabismus. At this time a large central chorioretinal defect was present in the affected eye, together with a large absolute central scotoma. The defective vision could not be improved with glasses. No constitutional cause for the condition could be found. One year and five months later the chorioretinal lesion showed no significant change and the child made no complaint of the eye. One year and 10 months after the second examination the child returned acutely ill, with evidence of glaucoma. Now for the first time a mass was visible in the vitreous and the retina was seen to be partially detached. At no time was there noticed a reflection of light from the interior of the eye (amaurotic cat's eye). On the basis of the long history it was not difficult to make the differential diagnosis from glioma. Enucleation of the eye was indicated owing to the presence of glaucoma. Pathologic examination showed widespread atrophy of intraocular structures, gliosis, and proliferation of retina and choroid.

Summary

Pseudoglioma is a name applied to a number of conditions of different etiology which simulate glioma by presenting the typical phenomenon of amaurotic cat's eye and a mass in the vitreous behind the lens. Most frequently pseudoglioma is secondary to a metastatic ophthalmia following an acute infectious disease of childhood or a gastro-intestinal infection. The differential diagnosis from glioma may be extremely difficult or impossible clinically. Enucleation of the eye, which is functionally useless, is considered good practice unless all doubt of the diagnosis can be eliminated, which is seldom possible.

A case of pseudoglioma is reported which was under observation for more than three years. At the first and second examination, nearly a year and a half apart, the only change observed in the fundus was a large central chorioretinal defect. At the third examination, about 1 year and 10 months later, a mass was visible in the vitreous, the retina was partially detached and glaucoma was present. At no time was a light reflex from within the eye observed.

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SULFONAMIDE THERAPY OF TRACHOMA

An experimental study with a critical analysis of the literature*

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The adoption of sulfonamide derivatives for the treatment of various ocular manifestations has aroused considerable interest and enthusiasm in ophthalmology. Among other infections subjected to experimental study with these drugs, trachoma and, to a less extent, the related inclusion-bearing conjunctivitides have been given repeated trials in various countries. While opinion remains divided as to the actual efficacy of sulfonamide compounds in trachoma, it must be admitted that, by popular impression at least, their therapeutic effectiveness in this condition has been largely accepted. In an earlier investigation[1] in which one of the present writers participated, however, trachoma did not respond so favorably to the action of sulfanilamide as had been anticipated at the outset of the study. Since the publication of these observations, an additional number of reports have appeared for the most part stressing the curative value of sulfanilamide and its related products in trachoma. It has consequently become desirable to restudy this form of treatment with the object of establishing, if possible, an explanation for the discrepant results observed by various investigators. With completion of the study, it seemed a timely opportunity to review thoroughly the pertinent literature for the purpose of critical analysis. The present communication, therefore, will serve primarily as a report of the experiments conducted, and secondarily as a critique of the publications appearing up to the time of writing.

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Methods of study

The bulk of the study was conducted at the Missouri Trachoma Hospital at Rolla, Missouri. The patients, originally 31 in number, were reduced to 26, since the remaining five for one reason or another refused to continue treatment too early in the experiment to be of consequence in the study. They were all native whites, hospitalized during the entire period of observation. Treatment consisted of the oral administration of sulfanilamide, the dosage calculated on the basis of body weight as recommended by Loe;[2] namely, one-third grain per pound of body weight for the first 10 days of treatment, and then one-fourth grain for the following 14 days, the drug being given in three doses, with an equivalent quantity of sodium bicarbonate. No other form of treatment was given, although irrigation with saline and boric acid was carried out each morning. In cases of corneal ulceration, atropine was applied locally as indicated (for example, iritis), a measure which functions not as a curative, but as a palliative.

Detailed clinical examinations were made once a week when visual readings were also determined. Temperatures were taken twice daily, and complete blood counts, including differentials and hemoglobin estimation (by the Sahli method), were made at least once a week and in most patients more frequently. In order to estimate the adsorption of sulfanilamide, determinations of the blood concentration were made once a week or oftener

by the method of Marshall and Litchfield.[3] Conjunctival scrapings were examined for the presence of inclusion bodies so that their behavior during treatment might be ascertained. The frequency of inclusions when present, however, was so low in the patients observed, that the appertaining data appear of little if any value, and for that reason they need not be considered in this report.

In addition to the patients treated by oral administration, a group of nine individuals was observed at the Washington University Clinics and a group of three at Rolla under topical applications of 2½ percent neoprontosil.* For the most part, these patients treated themselves and reported for examination at the clinic once a week. The neoprontosil was applied as drops four times a day.

Types of patients selected for study

No particular effort was made to select any of the patients for this study. They were accepted as they were admitted to the hospital, unless the disease appeared to be inactive and the predominant condition was obviously complicatory and demanded correction by surgical measures. Nevertheless, analysis after the treatment suggested that presentation of the data might be more readily accomplished by a partition of the patients into four clinical groups: one, consisting of seven patients in whom the infection was essentially limited to the lids, either in the form of follicular or papillary hypertrophy or both, and with little more than a beginning pannus without infiltration of the cornea (McCallan, types I and II); the second group, six in number, exemplified varying degrees of activity of both lids and cornea (types II and III); the third group was composed of nine patients with predominant and massive corneal disease (types III and IV), but exhibiting little or no involvement of the conjunctiva: the lids were more or less scarred and inactive, while the corneae varied in intensity of pannus, degree of infiltration, and scarring, but in every case the infection was distinctly active; and the last contained four individuals in whom the disease was not only corneal as in the preceding, but was in a stage of active ulceration. It was not expected that sulfanilamide would replace cicatricial tissue in the group of corneal patients; they were included for study only to determine whether the drug could terminate the activity of the disease.

Of the patients studied, 16 were males and 10 were females; their ages varied from 7 to 63 years, and their symptoms covered a duration of a few months to over 20 years. Thus, the trachoma was of less than one year's standing in five patients, of one to five years in three, of 6 to 10 years in four, of 11 to 15 years in four, 16 to 20 years on one, and of 20 years or more in eight. A number of the patients had had several admissions to the hospital in the past and their treatment had been extensive and varied, depending upon the predominant condition at the time. It is seen, therefore, that the total group represents a typical cross-section of both patients and disease.

Results of the treatment with sulfanilamide

Before considering the observed effects of sulfanilamide on trachoma, it may simplify the presentation of this report to illustrate in detail the methods of study and the interpretation of results. For this purpose, a sample protocol has been prepared by selecting five patients at random together with their correlated laboratory

* The writers are indebted to Dr. L. T. Post of Washington University for referring patients in his clinic for experimental treatment in this study, and to the Winthrop Chemical Company for a generous supply of neoprontosil.

TABLE 1

DETAILED DATA ON FIVE TYPICAL PATIENTS TO ILLUSTRATE METHOD OF STUDY

Patient	Total dosage (grains)	Sulfanilamide									Clinical Record				
		Blood conc. (mg./100 c.c.)	Toxicity	Effect on blood							Duration of Disease	Previous Hospital Admissions	Inclusions	Vision	Lids	Corneae
				Hb	RBC	WBC	Differential									
							P	L	M	E						
L.R., 30-M	1,035 (24 days)	—	P.M. temperature 99–100°F.	85	4.96	12,400	61	37	2		9 years	Once	Not found	OD—20/100 OS —20/30	Papillary and granular, general inflammation of bulbar conjunctiva, OU	OD—pannus 20 mm., active OS —pannus 3 mm., inactive
		4.16		83	4.15	11,100	72	27	1							
		2.46		80	4.08	9,400	59	40		1						
		2.23		82	4.22	9,400	60	38	2							
														OD—20/50 −1 OS —20/15	Arrested	OD—single, fine vessel, 6 mm. OS —no pannus
D.S., 12-M	525 (24 days)	—	None	74	5.40	7,300	58	41	1		6 yrs.	Three t imes	Not found	OD—20/200 OS —18/200	OU—cicatricial with activity	OU—pannus generalized and active
		3.96		72	4.26	7,800	64	36								
		2.48		69	4.04	6,500	53	47								
		2.04		60	3.00	7,800	68	32								
														OD—20/100 −1 OS —20/100	Same	Same
A.G., 12-F	430 (24 days)	—	None	82	4.80	7,500	66	34			9 mos.	None	Not found	OU—20/15	OU—granular, active	OD—pannus 3 mm. OS —beginning pannus
		3.73		74	3.98	6,700	53	43	4							
		—		76	3.98	8,600	58	40	2							
		2.59		76	4.61	6,600	49	47	2	2						
		2.27		72	4.64	8,000	60	40						OU—20/15	Same	OU—pannus 3 mm.
L.M., 18-M	915 (27 days)	—	P.M. temperature 99–100°F.	87	5.02	9,700	53	45		2	5 yrs.	None	Not found	OD—20/40 +1 OS —20/30	OU—granular, active	OU—pannus 15 mm., active
		3.02		78	4.75	7,900	61	39								
		2.77		83	4.60	7,700	62	36	2							
		2.39		76	4.86	6,600	62	38								
		2.40		82	4.78	8,300	68	32						OD—20/15 −1 OS —20/15	Same	OU—pannus 15–20 mm., irregular, active
J.T., 63-M	670 (24 days)	—	Headache malaise	72	4.67	13,100	61	35	4		23 yrs.	Three times	Not found	OD—H.M. at 1 ft. OS —blind	OU—cicatricial	OD—ulcer over pupil, pannus 3 mm., curtain type, cornea hazy, conjunctiva inflamed, hypopyon OS —hazy, scar over pupil, denuded area, pannus doubtful
		3.62		82	4.62	10,800	62	36	2							
		2.54		80	3.97	7,600	67	33								
		2.22		76	3.65	9,700	62	38								
														OD—H.M. at 6 in. OS —blind	Same	OU—opaque, dense scar

Under Patient, numeral indicates age, letter indicates sex.
Under Differential, P—polymorphonuclear cell, L—lymphocyte, M—monocyte, E—eosinophile.
The figures for Blood Concentrations and blood studies represent examinations made once a week or oftener.
The clinical data describe the clinical condition before and after treatment.

and clinical records. The sample data will be found in table 1. Thus, the variations in dosage and resultant blood concentration of sulfanilamide from week to week, and the fluctuations in hemoglobin and blood cells are all shown, while the clinical data indicate the number of previous admissions to the hospital, the duration of the disease, and the condition of the conjunctiva and cornea before and after treatment. The information assembled for these patients requires no explanatory comments.

It may avoid possible misconception to point out in the beginning the degree of adsorption of sulfanilamide in this study. As already stated, the patients received sulfanilamide *per os*, one-third grain of the drug per pound of body weight for the first 10 days of treatment. During this interval, the blood concentration of the drug ran close to 4 mg., plus or minus, per 100 c.c. of blood. With reduction of the drug to one-quarter grain per pound of body weight over the next 14 days, the blood level dropped proportionately, and the determinations during this period revealed blood concentrations varying between 2.0 and 2.5 mg. per 100 c.c. of blood. It was observed, moreover, that withdrawal of the drug caused a rapid decrease of the blood level, so that, in general, the drug was completely or almost completely eliminated within 24 hours. However, it is not necessary to elaborate on these observations for the moment, since the question of dosage and blood concentration will be considered more intimately later in this report.

A summary of the data bearing on the results observed following treatment with sulfanilamide is given in table 2. Upon analysis, it will be seen that the patients are classified by groups, depending upon their clinical manifestations, as explained earlier. Irrespective, however, of the type of trachoma, practically all patients undergo a rapid amelioration as measured by subjective symptoms. Thus, for example, photophobia is minimized, secretion or lacrimation is decreased, and a general feeling of increased comfort is simultaneously noticeable. How much of this improvement, however, is referable to sulfanilamide and how much to the general hospital care instituted is difficult to gauge.

The patients classified as Group I were seven in number and manifested predominantly a disease of the lids with only slight invasion of the cornea. Most of these patients would otherwise have been

TABLE 2

SUMMARIZED DATA ON THE EFFECT OF SULFANILAMIDE IN THE PRESENT GROUP OF PATIENTS

Type of trachoma	Number of patients			
	Treated	Arrested	Improved	Unchanged
Group I Essentially conjunctival trachoma	7	1	2	4
Group II Clinical activity in lids and corneae	6	1	3	2
Group III Essentially corneal trachoma	9	0	6	3
Group IV Corneal trachoma with ulceration	4	0	0	4
Totals	26	2	11	13

treated by grattage. At the end of treatment only one was asymptomatic, two were definitely improved, and four showed to all intents and purposes the same degree of involvement and activity as in the beginning. The second group, composed of six patients with clinical activity of both lids and corneae, presented at the end of treatment: one asymptomatic, three improved, and two approximately the same. Of the nine patients of the third group, so classified because the disease was limited almost entirely to the cornea, none could be called arrested; six showed varying degrees of improvement and diminished activity, while the remaining three remained as they were in the beginning. The fourth group, different from the preceding by the presence of active ulcers, contained four patients. Only one of these patients was carried through the entire course of treatment (see J. T., table 1). In this case, an active ulcer over the pupil of the right eye with hypopyon, the afflicted eye ruptured spontaneously on the thirteenth day of treatment. The patient's blood pressure was normal at the time, so that the incident was attributed entirely to the trachoma. Naturally he showed a certain degree of improvement, due, however, not to sulfanilamide but to rupture of the eyeball. The remaining three patients with active ulcers suffered considerable pain and exhibited no response to the drug so that after 7, 8, and 10 days, respectively, they were transferred to other forms of treatment. It was considered poor judgment to persist with an experimental treatment when the pain, which was great, could be alleviated by other measures. This was particularly true in view of the fact that others, as will be seen later, have reported not only improvement but even arrest in similar periods of time. Under the conditions, therefore, since no amelioration had become apparent, it seemed fair to regard the treatment as a failure, or at least as too delayed in its effect to be continued.

Thus, then, 26 patients with trachoma of different clinical varieties were treated with sulfanilamide *per os* as described above. With termination of the treatment, two were considered asymptomatic or arrested, 11 were regarded as definitely improved but still clinically active, and 13 maintained a more or less stationary clinical condition. In other words, half the patients profited from the administration of sulfanilamide. This proportion is reasonably close to that (60 percent) observed in the study[1] referred to above.

The patients treated with instillations of neoprontosil as stated previously were carried for two to three weeks in this manner. In all there was a definite improvement, not only subjectively but even clinically. The improvement was discernible within a few days and reached a maximum at about the end of the first week. From then on the clinical appearance remained stationary, and it became obvious even after another week or two of continued instillations, that whatever benefit was to be derived from this method had already occurred. Consequently, it became necessary to resort to one or another of the metallic salts, in order to render the patients asymptomatic.

Toxicity of sulfanilamide

The potential toxicity of sulfonamide derivatives has been emphasized frequently by a number of workers, so that there is no necessity for reviewing the different manifestations at this time. As a matter of record in this study, however, it seems desirable to summarize briefly the incidence of toxic reactions observed in the present group of patients. In five patients it was necessary to distcontinue sulfanilamide because of its deleterious effects; in one, the red-cell count dropped

progressively from 4,210,000 to 3,000,000, with the hemoglobin value decreasing from 78 to 68 percent during nine days of treatment—bovinine was administered and it required a week before a count of 4,000,000 cells per c.mm. was attained; a second patient was dropped after 13 days because of severe headache and fever; and in three others, fever, cyanosis, and nausea had become troublesome, necessitating cessation of sulfanilamide on the 9th, 10th, and 13th days, respectively. Other toxic manifestations not sufficient to stop treatment were: fever, 15 patients, in only three of whom, however, the temperature reached above 100° F.; headache in four; marked cyanosis in three; and gastric disturbances in five. Only seven individuals apparently suffered no untoward reaction at all to the drug. Except for the patient mentioned, no marked effect was found on the blood cells, although several individuals showed a gradual diminution in the number of red cells (patients D. S. and J. T., table 1). As expressed previously,[1] most toxic reactions to sulfanilamide are relatively mild and negligible; in no case need they be dangerous, since sufficient warning to withdraw sulfanilamide is provided by one sign or another.

Review of collateral literature

Since Heinemann's[4] abbreviated report in 1937, which was the first to record the use of sulfonamide compounds in trachoma, 36 communications have been located up to the time of writing. This would appear to be a number large enough not only to justify an analysis, but to lend to it a certain degree of authenticity. In order to consolidate the literature for purposes of a review and in turn facilitate discussion, it has been found expedient to summarize the available information in the form of a table, assembling therein the essential observations from each investigation. In table 3, therefore, the results of this arrangement will be found. No effort has been made to give the individual authors exact priority for their observations except by year, and then they have been given alphabetical rather than temporal precedence. It is unfortunate that in many of these reports, important details are omitted, and in others, the results are described in such broad generalities that an accurate summarization is not only impossible, but the statistics must be derived by the reader and they may, therefore, be subject to individual interpretation. Consequently, while a number of the publications are inadequate for precise compilation, they are nevertheless included for the sake of thoroughness. In their own way, however, these particular papers suggest the quality of the evidence put forward to answer so important a question.

Summarization of the collected literature including the present communication reveals that of 36 different reports, two[35, 36] may be excluded as representing previously expressed opinions and may, therefore, be regarded as duplications, while another[37] reports a single case in such lack of detail as to be of little use for review. Of the remaining 33, 11[2, 4, 7, 14, 15, 21, 24, 26, 28, 29, 33] are on record as upholding more or less unreservedly the curative effect of sulfonamide drugs on trachoma operating in the absence of any other form of treatment. Five other authors[5, 17, 19, 22, 27] similarly express confidence in the efficacy of these drugs, but the evidence submitted in support must necessarily remain open to question, since the drug treatment was used in conjunction with one or more of the topical agents usually employed. Nine more publications[1, 8, 11, 13, 16, 18, 20, 32, 34] either record varying degrees of improvement with even occasional arrest, or recommend the drug treatment in special

TABLE 3

COLLECTED DATA ON TREATMENT OF TRACHOMA WITH SULFONAMIDE DRUGS

Observer	Date	Drug	Dosage	Concurrent Treatment	Number of patients				Comments
					Treated	Arrested	Improved	Unchanged	
Heinemann[4]	1937	Septacine Sulfanilamide	Not stated	Not stated	3	3	0	0	Results termed "brilliant," therefore, interpreted as complete recovery
Burnier[5]	1938	Sulfanilamide	30 grains daily for 21 days	All had intensive local treatment, 3 even grattage	15	3	9	3	
Dik[6]	1938	Sulfanilamide	1½ grams, 14 days	Usual local treatment	2	2	0	0	Suggests sulfanilamide as adjunct to usual local treatment. See text
Gradle[7]	1938	Sulfanilamide	Not stated; presumably same as Loe[10]	Presumably none; not stated	41	?	?	10(?)	Figures not analyzed; results summarized in general statements. See text
Kirk, McKelvie and Hussein[8]	1938	Sulfanilamide	22½ grains daily in alternate 7-day courses	Presumably none; not stated	25	9	12	4	
Lian[9]	1938	Sulfanilamide	Rate and dosage variable	The usual metallic salts	30	4	16	4	5 patients unaccounted for in protocols;1 recovered but later suffered relapse. Suggests sulfanilamide as adjunct to usual local treatment, "since by itself it cannot cure trachoma"
Loe[2]	1938	Sulfanilamide	½ grain/lb., 10 days ¼ grain/lb., 14 days	None	140	?	?	?	No statistical analysis given by Loe; conclusions stated in general terms; impression is that all were arrested
Wilson[10]	1938	Prontosil rubrum	½–¼ grain/lb., 5 days ½–¼ grain/lb., 35 days	None	10	0	0	10	
Burnet, Cuénod and Nataf[11]	1939	4:4[1] di-amino-di-phenyl-sulfone-glucose	Variable quantity injected subconjunctivally of 7% solution	None	18	8	10	0	Suggest treatment is particularly effective in corneal but not in conjunctival cases
Busacca[12]	1939	Various preparations	Variable, as drops, ointment, injections by mouth	Not stated		Not stated			"No influence on purely trachomatous manifestations
Cavara[13]	1939	Streptosil	1.8 gram, 10 days .9 gram, 15 days	None	142	Not adequate for analysis			Believes little or no action of conjunctival disease; while effective in cicatricial, corneal trachoma; suggests effect of drug primarily on secondary infection
Dejean and Roux[14]	1939	Soluseptazine	Repeated injection—1 c.c.	None	15	0	12	3	2 of those unchanged were classified in the original article as "only slightly improved"
Forster[15]	1939	Sulfanilamide	½ grain/lb., 21 days; course repeated if necessary	None	167	167	0	0	
Guyton[16]	1939	Sulfanilamide	Not stated	Presumably none	2	0	2	0	Blood concentration of drug averaged 6 mg. %
Hatchek[17]	1939	Sulfanilamide	15 grains daily for 10 days; 2.5–5.0 c.c. 5% prontosil intramuscularly every 2 days	Various local treatments; some cases foreign protein also	228	Apparently all healed eventually except 15 follicular cases with secondary infection, the trachoma remaining after secondary condition had subsided			Author gives total number of patients as 228; by actual count of patients listed, there are, however 221
Hirschfelder[18]	1939	Sulfanilamide	½ grain/lb. 1st wk. ¼ grain/lb. 2d wk.	Presumably none; not stated	25	?	?	?	Data impossible to analyse. 2 of 4 groups of patients unimproved by drug treatment; numbers not given
Jasseron and	1939	Para-amino-	2 grams, 5 days	Local treatment	21	19	2	0	

Hirschfelder[15]	1939	Sulfanilamide	½ grain/lb. 1st wk. ¼ grain/lb. 2d wk.	Presumably none; not stated	25	?	?	?	Data impossible to analyse. 2 of 4 groups of patients unimproved by drug treatment; numbers not given
Jasseron and Morard[19]	1939	Para-amino-phenyl-sulfa-mide	2 grams, 5 days 1½ grams, 4 days 1 gram, 4 days	Local treatment with silver, etc.	21	19	2	0	
Jejebian[20]	1939	Rubiazol	2–3 grams a day for 5–15 days	None	8	2	3	3	Suggests drug as adjuvant to other methods, not as curative
Julianelle, Lane and Whitted[1]	1939	Sulfanilamide	½ grain/lb., 10 days ¼ grain/lb., 14 days	None	113	21	48	44	
Richards, Forster, and Thygeson[21]	1939	Sulfanilamide	½ grain/lb., 10 to 53 days	Presumably none; not stated	12	11	1	0	
Shimkin[22]	1939	Sulfanilamide	45 grains daily, 10–14 days	Local treatment with metallic salts	7	4	3	0	In footnote it is stated that since going to press "11 further cases . . . were completely cured." No data, however, are given
Schwarz[23]	1939	Sulfanilamide	2–3 grams a day	Local treatment with silver or copper	26	0	20	6	All patients were subsequently treated with injections of antimony salt
Spearman and Vandevere[24]	1939	Sulfapyridine	7½ grains every 4 hours over variable periods	Presumably none; not stated	2	1	1	0	Arrested patient had been previously on local treatment and sulfanilamide (65 grains, 1 month) without significant change
Szinegh[25]	1939	Deseptyl Elektyl	2 courses 6 tablets daily for five days with rest period, 5 to 8 days	Various	53	No analysis given			Suggest drugs do not "cure" trachoma, but alleviate. Particularly effective on corneal disease and secondary infection
Wilson[26]	1939	Sulfanilamide	½ grain/lb., 3 wks. ¼ grain/lb., 3 wks.	2% sulfanilamide ointment locally	18	18	0	0	Blood concentration 3.5 to 4 mg. %
Zachert[27]	1939	Antistreptin	1–2 tablets (0.3 gram), 2–3 times daily, 5–10 days	"Usual local treatment"	65	43	?	?	Original paper not available; figures obtained as given from abstract (q.v.)
Harley, Brown, and Herrell[28]	1940	Sulfanilamide or neoprontosil	Variable	Presumably none; not stated	11	1	10	0	Dosage varied considerably in different patients
Lee and Rottenstein[29]	1940	Sulfanilamide Sulfapyridine	Dosage variable, given intramuscularly or orally or both ways	None	95	Data not adequately given for this analysis			Authors believe drugs effective
MacCallan[30]	1940	Sulfanilamide	3 grams, 1 day 2 grams, 9 days	None	Not stated				Author states "trachoma unaltered . . . elimination of superimposed bacteria"
Poleff[31]	1940	Various compounds	Variable	Variable	25(?)	Not clearly stated			Oral and intramuscular administration with usual treatment gives satisfactory results
Spining[32]	1940	Sulfanilamide	½ grain/lb., 10 days ¼ grain/lb., 14 days	None	32	0	17	15	15 unchanged patients were all adults
Thygeson[33]	1940	Sulfanilamide	Variable	Presumably none; not stated	31	16	11	4	Dosage varied considerably in different patients
Present report[34]	1940	Sulfanilamide	½ grain/lb., 10 days ¼ grain/lb., 14 days	None	26	2	11	13	

Subsequent papers were published by Lian[35] and Jasseron and Morard.[36] Except for increasing the number of patients, nothing new is added; in particular, no analysis is given of the results observed, and opinions are expressed in general terms. A report of a single case with no statement other than recovery was reported by Kopperburg.[37] This is not listed above because of insufficient data as well as the statistical unimportance of one case.

It will be realized that in the absence of specific information, it was necessary to draw conclusions depending upon the writers' judgment, so that it is more than possible that another reviewer might express a different opinion in certain instances concerning the effect of the drug.

forms of trachoma, particularly the corneal variety. Somewhat in the same category are the five authors[6, 9, 23, 25, 31] who, while admitting a definite virtue to sulfanilamide and its derivatives, nevertheless regard the action incomplete and, therefore, recommend that such therapy be supplemented by one of the commoner local treatments. The remaining three references[10, 12, 30] report the sulfonamide compounds as ineffectual in trachoma.

It would be desirable at this point to complete the summarization of table 3 by computing the grand totals; namely, total number of patients treated, arrested, improved, and unaffected by the sulfonamide compounds. This is, however, impossible since in certain instances the authors neglected to give the number of patients treated; in others, no analysis of the patients was made; and finally, where local treatment was also applied simultaneously a breakdown is obviously without meaning.

In order to appraise the quality of the evidence submitted, it may be profitable at this point to analyze individually the communications which advocate the efficacy of sulfonamide therapy in trachoma. Heinemann's report[4] published in abstract form gives only the information that the results in three of three patients were "brilliant." Gradle[7] gave sulfanilamide a trial in 41 patients, 10 (25 percent) of whom are specifically described as not responding to the treatment; no further statement is made of the remaining 31 except that sulfanilamide may not be effective in early trachoma; therefore it is difficult to ascertain what actually happened in 75 percent of the patients' although the omission may imply recovery. So also in Loe's[2] series of 140 trachomatous individuals, no analysis is given, and by inference the reader is left to assume that all were healed. Dejan and Roux[14] are high in their praise of the drug, but analysis of the clinical records suggest that in none of 15 patients was the disease arrested, 12 underwent various degrees of improvement, and 3 were unaffected. Spearman and Vandevere,[24] who consider sulfapyridine superior to sulfanilamide, studied only two patients, only one of whom can be accepted as asymptomatic from the accompanying data. Harley, Brown, and Herrell[28] report on 11 patients without giving an analysis; if the reader therefore be justified in drawing his own conclusions from the protocols of the individual patients, it would seem that only one patient was actually "cured," the remaining 10 presenting different stages of amelioration. The most recent publication of all[29] describes treatment of 95 patients. The authors approve of the drug treatment, but unfortunately submit little data to illustrate the actual efficacy of the therapy instituted. Thygeson[33] also reports successful treatment of trachoma with sulfanilamide, but his gradient of efficiency is roughly 50-percent recovery. On the other hand the remaining three publications[15, 21, 26] recording sulfonamide therapy as highly effective in trachoma list their results as practically 100 percent effective, and the supportive evidence appears to be in order. As for the reports employing drug therapy in conjunction with local treatment, evaluation of the data is not only difficult, but of questionable value as well.

Of those authors observing different degrees of improvement under sulfonamide therapy, all agree as to the amelioration of subjective symptoms (for example, photophobia, secretion, itching, blurry vision, and so forth). A large number, moreover,[1, 6, 8, 9, 11, 13, 17, 18, 23, 31, 32] hold that the effect of the drugs is much greater in the corneal disease, and little or absent in the follicular and papillary disease.

Another interesting outcome of this re-

view is the opinion of the different authors regarding the effect of the drugs on the common secondary infections accompanying trachoma. While the majority make no comments on this subject, eight[1, 5, 8, 12, 13, 17, 22, 30] believe the drugs effective on the superimposed condition and two (Thygeson[33] and Poleff,[31] the latter of whom arrived at his conclusion after application of drops for only eight days) deny this effect.

If an estimate is now made of the 36 publications reviewed in this report, in the manner outlined, it is seen that of the 11 reporting successful results following drug treatment alone only three can be accepted as actually supporting their conclusions with appropriate evidence. Five additional publications likewise report success, but the evidence is rendered doubtful by supplementary treatment with local agents. This is, therefore, a small proportion of papers justifying the opinion of the therapeutic effectiveness of sulfonamide drugs. If, on the other hand, improvement rather than "recovery" is taken as an index of efficacy, all but three of the 36 reports are in accord. It would seem, therefore, as several authors[6, 9, 20, 23, 31] have already recommended, that the sulfonamide compounds may serve a beneficial purpose in trachoma if supplemented by one or more of the orthodox topical treatments. In fact, this procedure has been employed by several workers as already referred to above.

Discussion

That adequate dosage is of paramount importance in the chemotherapeusis of infections is a precept formulated from repeated experience. In addition, it has become more or less axiomatic that wherever feasible the employment of large dosages over short periods is preferable to the employment of small dosages over prolonged periods. The reason for the preference is that, first, whatever destructive capacity the drug possesses may be exerted at once, and, secondly, by shortening the duration of treatment, there is less likelihood of the infectious agent's becoming adapted or "fast" to the particular drug.

A study of the dosages adopted by the different investigators reporting successful results from sulfonamide treatment of trachoma suggests either a complete apathy to the principles outlined above, or a practically complete intolerance of the virus of trachoma to these derivatives. Thus, the dosages employed vary from 15 grains to 90 grains or more a day, and the duration of treatment extends from a few days to 70 days or more. While variations in dosage and length of treatment are to be anticipated from case to case, differences of 5 to 6 times in daily dosage and 2 to 8 times in duration of treatment (with apparently equally beneficial effects at one or the other extreme) surpass the usual expectations. The few studies[16, 26, 28, 29, 33, 34] made on the blood level attained by the drug reveal variations up to 6 mg. per 100 c.c. of blood, although half this quantity was also reported effective. Moreover, if the blood level may be estimated from the dosages given, these same authors show that a considerably lower concentration (as 20 grains per day for an adult must attain, see reference 33) is still effective in eliminating the virus of trachoma. Perhaps no better illustration of the wide variation in dosage without altering the efficacy of the treatment can be offered than the reports made by different members of the U. S. Indian Service.[38] It has been, consequently, a difficult matter to decide on proper dosage in this study. The method first recommended by Loe[2] was finally adopted because of the success reported with it.[2, 7, 18] And this dosage, it must be

remembered, is in excess of that used with reported success by others.[5, 8, 17, 19, 25, 28, 33]

Clinical experience in trachoma suggests that complete recovery in all patients and complete lack of recurrence in all individuals rendered asymptomatic is an almost impossible achievement. Yet sulfanilamide has apparently done exactly this in two large groups of patients (140 and 167). Even though the patients were Indians, and it is admitted that trachoma in Indians does not approximate the severity of the disease seen in native whites (for example, in Missouri, Kentucky, Tennessee, Arkansas, and other states), the record is better than one would expect.

It may be of interest in this connection to point out that since going to press, Cooper has reported (vid. Arch. of Ophth., 1940, v. 24, p. 467) that of 34 patients treated with sulfanilamide, 21 (62%) suffered recurrences, 11 within six months after the end of treatment, and 10 within seven months to two and a half years. It is of further interest that in the present series of patients studied, one of the two discharged at the end of treatment as asymptomatic returned to the hospital since this report was written with an exacerbation requiring active treatment. The elapsed interval between discharge and recurrence was approximately four months.

The various degrees of improvement observed by the large majority of workers are more or less generally agreed upon, regardless of the drug, the dosage, or the method of administration. There is no doubt that within a few days the patient exhibits subjective improvement and "feels better"; the disappearance of photophobia, pain, blurred vision, itching, and other symptoms, adds to the patient's comfort, vision, and appearance. But this does not mean, of course, that recovery or inactivation of the virus in the tissues has been effected. One wonders, nevertheless, how much the improvement is the result of the specified treatment. Experiments conducted in the past by the present writers with various preparations, such as gentian violet, citric acid, yatakonin, quinine ointment, chalmoogra oil, and other medication, revealed that all induced a measure of improvement, to a greater or less extent; consequently, the impression was unavoidable that the hospitalization, the daily irrigations, and the special treatment experimental patients always receive were unquestionably responsible for an appreciable portion, if not all, of the improvement. Comparison of the treatment described above with the usual treatment with metallic salts, and other means, indicates to the present writers that the patients treated wih sulfanilamide would also have improved under the usual form of treatment. And in those cases where grattage was indicated, the results would have been more gratifying.

Summary and conclusions

1. A study of sulfonamide therapy in trachoma has been undertaken in the manner described above.

2. Following the administration of sulfanilamide *per os* to 26 patients, the disease in 2 was arrested, 11 were improved, and 13 unchanged at the end of the treatment.

3. Following neoprontosil applied topically as already outlined, a definite improvement, was observed in all of nine patients. All were subsequently given some other form of treatment in order to render them asymptomatic.

4. A review of the correlated literature has been made and the results have been analyzed.

5. A conservative opinion at the present time would be that sulfonamide compounds cause a disappearance of the nonspecific (that is, subjective) symptoms of

trachoma and an improvement of varying degrees in the clinical condition; evidence of their curative capacity remains to be established.

6. It is the opinion of the present writers that in spite of the improvement, "recovery" from trachoma is not the rule but the exception.

7. It, therefore, seems the wiser procedure to supplement sulfonamide treatment with one of the more usual forms of local therapy.

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CONGENITAL COLOBOMATA OF THE LOWER LID*

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The appearance of congenital colobomata of the lower lid at the inner angle is a rare finding. There has been no previous report wherein three children (as well as all the children) of one family had similar defects. In each instance of the cases being presented these were bilateral. The only differences between the three were in the degree of severity and the presence or the absence of lacrimal-sac defects and subsequent complications.

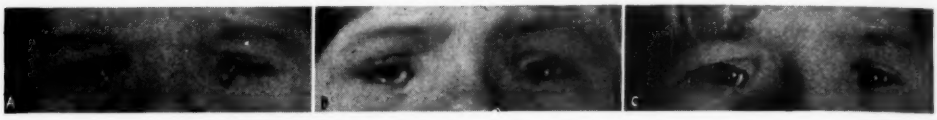

Fig. 1 (Spaeth). Cases A, B, and C, prior to any surgery.

The first of the three, J. (fig. 1A), had definitely outlined notchlike colobomata of each lower lid at the inner angle. In addition, she had no lacrimal sac, nor could one find any evidences of a superior portion of the lacrimal-nasal duct. The patient had normal superior puncti and canaliculi, but these terminated blindly at the inner canthal angle. The second of the two, M., had colobomata that were broader, not quite so deep, and with bandlike cicatrices at the apices; and while her superior puncti and canaliculi opened into the lacrimal sacs, the inferior canaliculi and puncti were wholly wanting. This patient, when first seen, had a bilateral low-grade suppurative dacryocystitis, apparently because of secondary infection combined with a possible defective lacrimal-nasal duct. Surgery uncovered a wholly satisfactory right nasal-lacrimal duct, but the left duct ended blindly a short distance below the lacrimal sac. B, of figure 1, illustrates M. when she was first seen. The third of the three children, L. (fig. 1C), had the broadest colobomata of all. His defects were the least conspicuous, though his epicanthal folds were most evident. His superior puncti, superior canaliculi, and lacrimal sacs were normal. His lacrimal-nasal ducts were apparently also normal and quite patent, as determined by irrigation through the superior puncti. He had no inferior puncti nor inferior canaliculi. Thus, in addition to the colobomata of the lower lid, each of the three children had varying degrees of congenital defects of the lacrimal puncti, canaliculi, and sacs and lacrimal-nasal ducts with complicating secondary pathology.

The embryological development of these abnormalities is of great interest, though this was not the most important factor for these patients. The parents were normal and themselves without any known congenital defects. All three children were born at term, and were otherwise wholly healthy. The undeniable familial interrelationship of the defects, their essential similarity, and their constant presence in single births seems to suggest an hereditary character in spite of the fact that these defects as single instances have always been considered

* From the Wills Hospital, Philadelphia, Pennsylvania. Read before The Section of Ophthalmology, Philadelphia College of Physicians, April 18, 1940.

nonhereditary. Also, it is rather likely that Seefelder's idea that these defects are the result of a localized breaking down of the interpalpebral adhesions during the process of lid differentiation is much more reasonable than that they are the result of casual amniotic bands or of abnormal adhesions. Certainly, the accompanying lacrimal-sac and duct defects will support this possibility. It is equally unlikely that the defects are the result of facial-cleft abnormalities, for these clefts do not enter into the formation of either the lids or the lacrimal sacs.

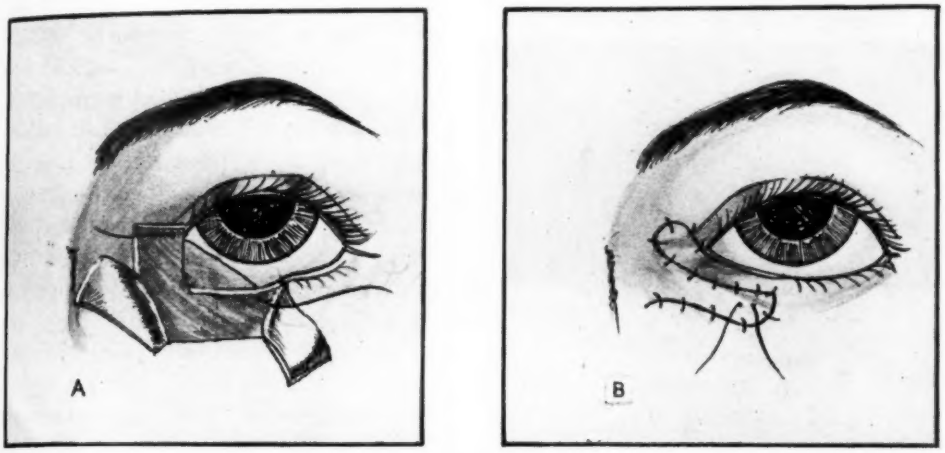

Fig. 2 (Spaeth). Flaps for primary correction; suture shown, when tied, will elevate the inner angle of the lower lid, move it medially, and should close the coloboma. The skin flaps, when interchanged, will hold this correction firmly in position.

The surgical corrections of these defects presented a rather complicated problem. It was evident that the notching had to be corrected, and, further, that the obliquely displaced lower-lid margins had to be moved upward and toward the midline. The epicanthus which accompanied each case made available a certain amount of tissue at the inner angle for necessary transplantation. Some modification of epicanthus surgery was therefore to be utilized.

Figure 2 illustrates the pedicle flaps that were cut and used as the first stage for correction in each patient. One flap was outlined and lifted, hinged medially, from the epicanthal fold, and a second flap cut and hinged laterally from along the line of the lid margin itself. This margin was then freshened by the resection of the notch of the coloboma, and the obliquity and the notching of the margin corrected by closing the V of this freshened internal canthal angle into a straightly placed, almost vertical suture line coapted with buried 6-0 plain catgut sutures. The pedicle flaps cut were then sutured as in B of figure 2, the one from the epicanthal fold directed outward, while that from the lid margin was raised and directed upward and inward. In this way, the raw surface was covered, and, at the same time, the palpebral fissure held in the correction obtained by the buried catgut sutures. Figure 3 illustrates the correction obtained in each instance following this procedure. That of A is very good, considering the severity of the case, but one can see that there is still a depression close to the midline of the lower lid. In B the correction is perhaps a little better. The epicanthus, however,

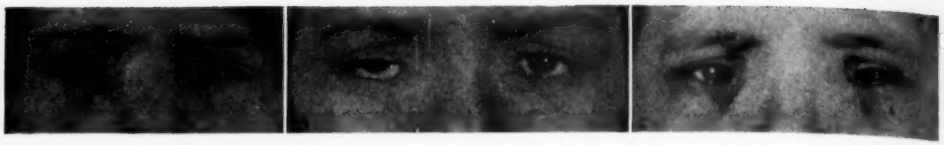

Fig. 3 (Spaeth). Cases A, B, and C, after primary flaps.

seems to be augmented and at the same time some ptosis, which had been present before, has become more manifest. The correction of C was similar to that of A; however, on the right here, there is still a fair amount of obliquity of the palpebral fissure, though the canthal angles are in rather good condition.

Fig. 4 (Spaeth). Case A, after V-Y incision and suture.

A of figure 3 was further corrected by the classical V-Y incision. The suture lines as illustrated in figure 4 show the satisfactory elevation of the lid margins which was obtained through this procedure. The patient was discharged following the removal of these sutures without further treatment. The lacrimal-sac defects were so gross that it was held inadvisable to attempt any reconstruction of them. The patient had a certain amount of epiphora, but it was of no great clinical significance. The epicanthal defects and the ptosis, seen to be residual in B of figure 3, were resected and further utilized for additional correction as outlined in figure 5. The pedicle flap which was lifted there passed over into the lower lid rather farther than the illustration indicates, well past the midline, and there sutured. Figure 6A shows the sutures still in position; in B of figure 6, the sutures have just been removed, and the patient is about to be discharged from the hospital. She had recovered, apparently completely, from the suppurative dacryocystitis.

L.'s greatest defect was in the residual obliquity of the palpebral fissure. Because of his satisfactory lacrimal apparatus, he needed a good canthal angle at a proper level. The Siklösy incision as carried out for the correction of ectropion was util-

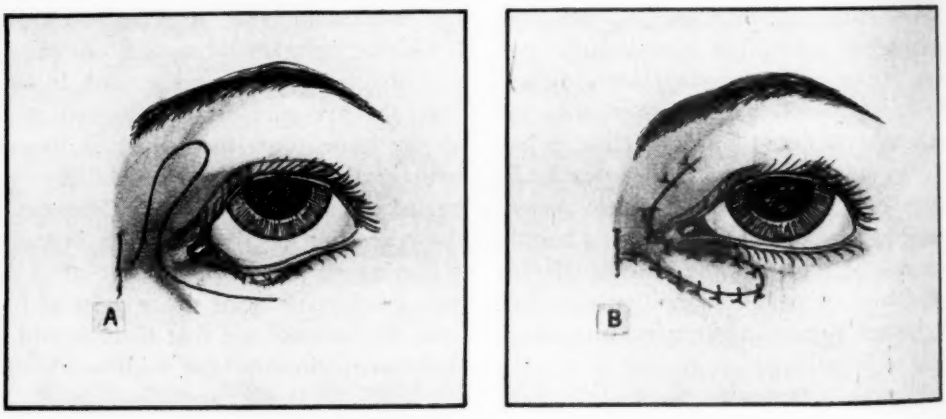

Fig. 5 (Spaeth). Secondary, or additional, flap for case B.

ized as seen in figure 7A. The vertical incision lay across the canthal angle at an equal distance into the upper lid and below the level of the canthal angle into the lower lid. The incision line was closed, as outlined in B. Figure 8A illustrates the boy with these sutures still in place, and it extended over a period of several years to the correction illustrated.

There are several well-known procedures for the correction of colobomata, but the major number of these are limited mechanically to the correction of such defects as they appear in the upper lid.

Fig. 6 (Spaeth). Suture lines, for procedure illustrated in Fig. 5, as carried out for case B; C illustrates the case immediately after the removal of the sutures.

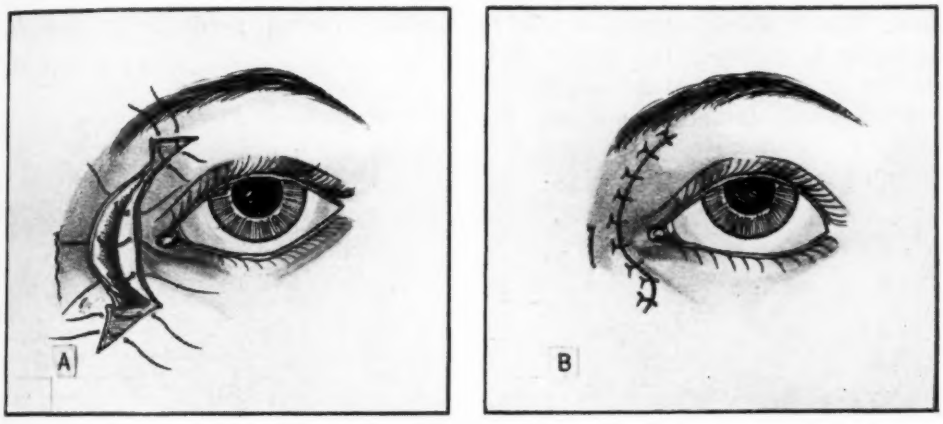

Fig. 7 (Spaeth). Siklösy incision and suture.

Fig. 8 (Spaeth). Suture lines, A, and end result immediately after the removal of the sutures, as carried out in case C, according to technique of Fig. 7.

B of figure 8 the same case immediately after discharge from the hospital after these sutures had been removed.

Comment

The three cases illustrated are of rather unusual interest. The surgery for their correction was not unusually difficult, but these same techniques, undoubtedly, would apply to a large number of cases of lower-lid defects were it not for the slightly different anatomy of the lower lid. The well-known halving operation could not be used here at all, though in one instance the defect present was so deeply vertical as to permit consideration

of it. The absence of any satisfactory medial lip for surgery, as is demanded in this technique, made it seem impractical.

The accompanying lacrimal disturbances were disposed of as follows. That seen in A, that is J., was dismissed without further consideration. Some epiphora was her only residual complaint. That present in B had to be corrected by repeated irrigations of the lacrimal sac through the superior punctum, by the use of silver salts, and through massage. Fortunately, she has not as yet developed an inflammatory empyema of the sac there. If this should appear, it will be necessary to extirpate the sacs in their entirety. It is hoped that the prophylaxis which has been outlined as a routine for this child will prevent such an occurrence. The parents of the child have been informed that a dacryocystorhinostomy may be necessary in later years, but this is to be postponed as long as it is possible to do so. The lacrimal pathology in C needs no further consideration, for the boy has only a bit of epiphora of which he does not complain; its presence being determined only by questioning the patient.

The ptosis that is residual to a certain extent in M., of B, may need some further correction in later years, especially in the right eye, but for the time being nothing further needs to be done for this.

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TOTAL LIPID AND CHOLESTEROL CONTENT OF CATARACTOUS AND SCLEROSED HUMAN LENSES*

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The total lipid[1] and cholesterol[2] contents have been studied already in relation to cataract, and the total lipid content[3] also in relation to sclerosis. So far, however, no study has been made of the cholesterol content in relation to sclerosis. Since both cholesterol[4] and sclerosis are said to be chiefly limited to the nucleus, a study of the relation between the two was thought to be desirable. As a step in this study, the total lipids were also determined.

In all, 259 lenses were analyzed. They were removed from the eyes by the intracapsular method after the stage of cataract had been first determined by the use of the biomicroscope. They were placed separately on small pieces of filter paper of known weight and weighed on a sensitive chemical balance. Then the stage of sclerosis was determined by a previously employed macromethod.[5] The total lipids were extracted from each lens separately, first with 3 c.c. of a 1:1 chloroform-alcohol mixture, then consecutively with 2 c.c. of acetone, 2 c.c. of 1:4 ether-alcohol mixture, and again with 2 c.c. of acetone. The extractives were filtered each time through a small filter paper into small, thin-walled, specially made weighing bottles.[3] Finally the filter paper was washed with 2 c.c. of acetone, and the bulk of the combined extractives evaporated at room temperature. The last fraction of the extractives was evaporated at a temperature of 65°C. The determination of the total lipids was carried out gravimetrically,[3] that of cholesterol by the colorimetric method of Bloor.[6]

TABLE 1

MINIMUM, MAXIMUM, AND AVERAGE TOTAL LIPID AND CHOLESTEROL VALUES OF CATARACTOUS LENSES ACCORDING TO STAGE OF DEVELOPMENT

Stage of Catar.	No. of Lenses	Age of Pt.	Duration Years	Weight gm.	Total Lipids		Cholesterol		% Ratio of Chol./Tot. Lip.
					Mg. per Lens	Percent	Mg. per Lens	Percent	
Incip.	151	45–88	0.5–12	0.158–0.274	2.0–7.8	1.17–3.54	0.75–1.88	0.36–0.80	
Aver.		69.3	2.8	0.2125	3.55	1.681	1.230	0.583	34.65
Intum.	32	57–84	1.0–10	0.154–0.280	2.5–7.5	1.26–3.22	0.83–1.51	0.39–0.66	
Aver.		72.6	2.7	0.2112	3.92	1.835	1.204	0.586	30.71
Mature	66	46–86	0.2–15	0.072–0.251	0.8–5.3	1.11–2.67	0.71–1.60	0.45–0.81	
Aver.		69.5	4.5	0.1909	3.27	1.774	1.127	0.607	34.45

In table 1 the results are classified according to stages of cataract. They corroborate those of previous investigations. The average weight of the lens decreases from 0.2125 gm. in the incipient stage to 0.1909 gm. in the mature stage. While there is a slight decrease in the absolute amount of both total lipids and cholesterol in mature (3.27 mg. and 1.127 mg.) as compared with incipient cataracts (3.55 mg. and 1.230 mg.), in terms of percentage, there is an increase from 1.681 percent of total lipids and 0.583 percent of cholesterol in the incipient stage to 1.774 percent and 0.607 percent, respectively, in the mature stage. This is due to the loss of weight of the lenses with advanced stages of cataract, the loss

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in total lipids and cholesterol, however, being proportionally much smaller than that of other substances, such as the proteins. The percentage ratios of cholesterol to total lipids are 34.65, 30.71, and 34.46 percent in the incipient, intumescent, and mature stages of cataract, respectively. The cataractous lenses in the intumescent stage contain, therefore, some 11 percent less cholesterol, in comparison to total lipids, than those of the other two groups. In this study the average weight of the lenses in the intumescent stage happens to be less than that for the incipient stage and therefore the lower percentage of cholesterol of the former cannot be due to a proportionally higher content in protein; it is chiefly due to the higher content of the lipids other than cholesterol. One of the outstanding physiological functions of cholesterol is to counteract the absorption of water.[7, 8, 9] It is therefore possible that not all cataractous lenses, in their development from the incipient to the mature stage, go through the intumescent stage, but only such as are low in the percentage ratio of cholesterol to total lipids. This is also strongly indicated by the fact that, on the whole, there are twice as many mature and six times as many incipient as intumescent cataracts.[2, 3, 5] If the mature stage were always preceded by the intumescent stage, then, according to the law of chance, the number of the intumescent cataracts should likewise be intermediary between the numbers of the incipient and the mature cataracts.

In table 2 the results are arranged according to stages in sclerosis. Here similarly, as in the case of cataract, the average weight of the lens decreases rather uniformly from 0.2114 gm. in practically normal lenses (0) to 0.1931 gm. in lenses with highly advanced sclerosis (++++). There is also a commensurate decrease in the absolute amount of cholesterol; that is, from an average of 1.210 mg. in practically normal lenses to an average of 1.165 mg. per lens in the last stage of sclerosis. The total lipids, however, increase from an average of 3.42 mg. to 3.63 mg. per lens, respectively. On the relative basis, both the total lipids and the cholesterol increase from 1.636 and 0.572 percent in practically normal lenses (0) to 1.850 and 0.608 percent in lenses with highly advanced sclerosis (++++), respectively. There is, therefore, an actual increase in the total lipids with advanced sclerosis, whereas the percentage of increase in cholesterol is due only to the decrease in the average weight of the lenses. Accordingly, the percentage

TABLE 2

MINIMUM, MAXIMUM, AND AVERAGE TOTAL LIPID AND CHOLESTEROL VALUES OF SCLEROSED LENSES ACCORDING TO STAGE OF DEVELOPMENT

Stage of Scler.	No. of Lenses	Age of Pt.	Duration Years	Weight gm.	Total Lipids		Cholesterol		% Ratio of Chol./Tot. Lip.
					Mg. per Lens	Percent	Mg. per Lens	Percent	
0	36	45–80	1.0–6	0.162–0.261	2.3–4.9	1.25–2.28	0.97–1.67	0.44–0.69	
Aver.		64.5	2.2	0.2114	3.42	1.636	1.21	0.572	35.38
+	38	45–79	1.0–10	0.163–0.269	2.4–5.1	1.21–2.16	0.82–1.67	0.36–0.68	
Aver.		68.0	2.4	0.2194	3.54	1.618	1.23	0.565	34.80
++	60	50–88	0.2–10	0.149–0.270	2.0–7.8	1.18–3.22	0.90–1.60	0.41–0.81	
Aver.		68.6	2.6	0.2047	3.60	1.714	1.21	0.581	33.53
+++	87	50–86	0.5–15	0.126–0.274	1.7–5.5	1.16–2.82	1.74–1.88	0.39–0.77	
Aver.		71.6	2.6	0.1981	3.47	1.748	1.177	0.597	33.92
++++	38	46–84	1.5–20	0.072–0.279	0.8–7.5	1.11–3.54	0.21–1.51	0.44–0.80	
Aver.		68.5	5.8	0.1931	3.63	1.850	1.165	0.608	32.10

ratio of cholesterol to total lipids decreases at a rather uniform rate from 35.38 percent in practically normal lenses to 32.10 percent in the last stage of sclerosis.

From the data in table 3, it is seen that age has a greater influence than cataract and sclerosis on both the weight and the absolute amounts of total lipids and cholesterol of the lenses. There is a constant and a rather uniform increase in the average weight of 0.1634 gm. in the fifth to 0.2200 gm. per lens in the ninth decade. The total lipids and cholesterol increase with similar uniformity from an average of 2.62 and 0.975 mg. to 3.92 and 1.314 mg. per lens, respectively. To a lesser extent, there are also increases in the percentage content of total lipids and cholesterol with advancing age, and the changes occur with greater irregularity. Thus the lowest values are found in the sixth decade with averages of 1.582 percent of total lipids and 0.554 percent of cholesterol. But the highest percentage of total lipid values, in conformity with the trend of the absolute values, falls in the eighth (1.768 percent) and the ninth (1.765 percent) decades, and the highest cholesterol value of 0.603 percent is associated with the ninth decade. The highest percentage ratio of cholesterol to total lipids is, however, in the fifth decade (38.00 percent), and the lowest (31.54 percent) in the sixth decade. Otherwise, the decrease from 34.11 percent in the seventh to 33.30 percent in the eighth and to 33.52 percent in the ninth decade is fairly regular. This shows that the total lipids of the lens increase with advancing age at a faster rate than does the cholesterol.

TABLE 3

MINIMUM, MAXIMUM, AND AVERAGE TOTAL LIPID AND CHOLESTEROL VALUES OF CATARACTOUS AND SCLEROSED LENSES ACCORDING TO AGE

Age Decade	No. of Lenses	Age of Pt.	Duration Years	Weight gm.	Total Lipids		Cholesterol		% Ratio of Chol./Tot. Lip.
					Mg. per Lens	Percent	Mg. per Lens	Percent	
V	12	45–50	1.0–10	0.072–0.190	0.8–3.4	1.11–1.92	0.21–1.15	0.29–0.72	
Aver.		48.4	2.5	0.1634	2.62	1.603	0.975	0.593	38.00
VI	37	51–60	1.0–12	0.114–0.269	1.6–4.6	1.16–2.20	0.71–1.46	0.42–0.74	
Aver.		54.1	3.4	0.1948	3.04	1.582	1.059	0.554	31.54
VII	77	61–70	1.0–20	0.144–0.258	2.1–7.5	1.22–3.22	0.81–1.60	0.36–0.81	
Aver.		66.5	2.4	0.2008	3.41	1.725	1.163	0.596	34.11
VIII	111	71–80	0.2–15	0.154–0.279	2.1–7.8	1.17–3.54	0.83–1.72	0.39–0.80	
Aver.		74.7	3.6	0.2125	3.76	1.768	1.251	0.590	33.30
IX	22	81–88	1.5–15	0.189–0.274	2.9–4.8	1.41–2.28	1.05–1.88	0.50–0.73	
Aver.		82.8	5.0	0.2200	3.92	1.765	1.314	0.603	33.52

When the results are arranged according to the stage of sclerosis as it occurs within each of the three groups of cataract (table 4), sclerosis appears to have practically no influence on the weight of the lenses during the incipient and intumescent stages of cataract development, the range of variation in the average weight over the five different stages in sclerosis being only between 0.2059 and 0.2218 gm. In the mature stage of cataract, there is a definite decrease in the average weight from 0.1992 gm. in pronounced sclerosis (++) to 0.1830 gm. in very pronounced sclerosis (+++) and to 0.1700 gm. in highly advanced sclerosis (++++). The total lipid distribution, however, on the basis of both absolute amount and percentage, does not seem to have anything to do with sclerosis, the values being practically the same for the different degrees of sclerosis

within the same stage of cataract. Cholesterol values likewise, on the basis of both absolute amount and percentage, remain practically the same in all stages of sclerosis for lenses with incipient and intumescent cataracts. There is, however, a slight decrease in the absolute cholesterol values in the lenses with mature cataract and advancing sclerosis. This decrease from an average of 1.219 mg. in pronounced sclerosis (++) to 1.090 mg. per lens in highly advanced sclerosis (++++) is proportional to that in the average weight of the lens. On the basis of percentage the values increase from 0.612 to 0.634 percent, respectively; that is, by less than 4 percent. There appears to be again no relationship between sclerosis and the amount of cholesterol.

TABLE 4

AVERAGE TOTAL LIPID AND CHOLESTEROL VALUES OF CATARACTOUS LENSES ACCORDING TO STAGE OF SCLEROSIS

Stage of Cataract	Stage of Scler.	No. of Lenses	Weight gm.	Total Lipids		Cholesterol		% Ratio of Chol./Tot Lip.
				Mg. per Lens	Percent	Mg. per Lens	Percent	
Incipient	0	36	0.2111	3.61	1.637	1.214	0.572	33.63
	+	29	0.2218	3.57	1.608	1.279	0.563	35.83
	++	37	0.2127	3.46	1.622	1.011	0.575	29.22
	+++	37	0.2059	3.59	1.736	1.521	0.607	42.34
	++++	12	0.2100	4.22	1.993	1.216	0.579	28.81
Intumescent	++	14	0.2106	4.21	1.981	1.226	0.580	29.12
	+++	17	0.2114	3.70	1.729	1.180	0.557	31.90
Mature	++	9	0.1992	3.27	1.583	1.219	0.612	37.30
	+++	36	0.1830	3.33	1.831	1.154	0.616	34.66
	++++	21	0.1700	3.16	1.785	1.090	0.634	34.50

Somewhat greater, but more irregular, changes in cholesterol in connection with differences in the stage of sclerosis are shown by the percentage ratio of cholesterol to total lipids, but these changes are due to fluctuations in the total lipid values and not to those in cholesterol. Cholesterol therefore appears to be the less changeable fraction of the lipids of the lens, remaining practically the same throughout the wide gamut of lenticular changes due to different stages of cataract and sclerosis. Cholesterol is, however, connected with sclerosis and to a lesser extent with cataract from a different viewpoint. In the sound, normal lens a certain part of the cholesterol is in combination with the other substances, such as proteins and phospholipids.[5] The compound has the transparent, plastic, and colloidal properties of a gel. But due to autolysis, in consequence of repeated and prolonged injuries to the lens, this gel disintegrates into the insoluble free cholesterol and albuminoid on the one hand, and the soluble ingredients on the other hand. The latter gradually disappear by way of diffusion through the lens capsule and the insoluble parts remain, giving the lens an opaque, hard, and rigid texture.

SUMMARY

In all, 259 cataractous and sclerosed lenses were analyzed for total lipids and cholesterol. The average weight of the lens decreases in both cataract and sclerosis, but increases with age. Of all the lipid fractions, cholesterol is least affected by cataract, sclerosis, and age. But its percentage ratio to total lipids appears

to have a great deal to do with the water content of the lens. Thus the cholesterol content of the intumescent cataracts constitutes only 30.71 percent of the total lipids as compared with 34.65 and 34.46 percent of the incipient and mature cataracts, respectively. Likewise, the percentage ratios of cholesterol of total lipids decrease with great uniformity from 35.58 in lenses with practically no sclerosis to 32.10 in lenses with highly advanced sclerosis; that is, they decrease with increases in the water content of the lenses.[10] This inverse relationship between cholesterol and water content is further indicated by the decrease of the cholesterol–total-lipid ratio from 38.00 percent in the fifth decade to 33.52 percent in the ninth decade; that is, inversely to the changes in the water content.[10] These changes in the cholesterol-total lipid ratio are chiefly due to changes in the lipid fractions other than cholesterol, the total lipids being particularly high in intumescent cataracts.

Since there are six times as many incipient and two times as many mature cataracts as there are intumescent cataracts, it appears that not all lenses in their cataract development from the incipient to the mature stage go through the intumescent stage, but only such as are low in the cholesterol–total-lipid ratio. Otherwise the number of the intumescent cataracts, according to the law of chance, would be intermediary between those of the incipient and mature cataracts.

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NOTES, CASES, INSTRUMENTS

ANNULAR SCOTOMA

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Vicksburg, Mississippi

Annular scotoma is a characteristic feature of disease of the outer retinal layers and is prominent in syphilitic chorioretinitis and in retinitis pigmentosa. Accounts of this defect are reported in the foreign literature and in our own, following such various factors as administration of quinine, excessive use of tobacco, phototraumatism, and like conditions. In these cases, the defect is usually persistent. As a rule, in retinitis pigmentosa, which most of the older observers thought to be the only etiological agent, the ring widens with the loss of the peripheral field.

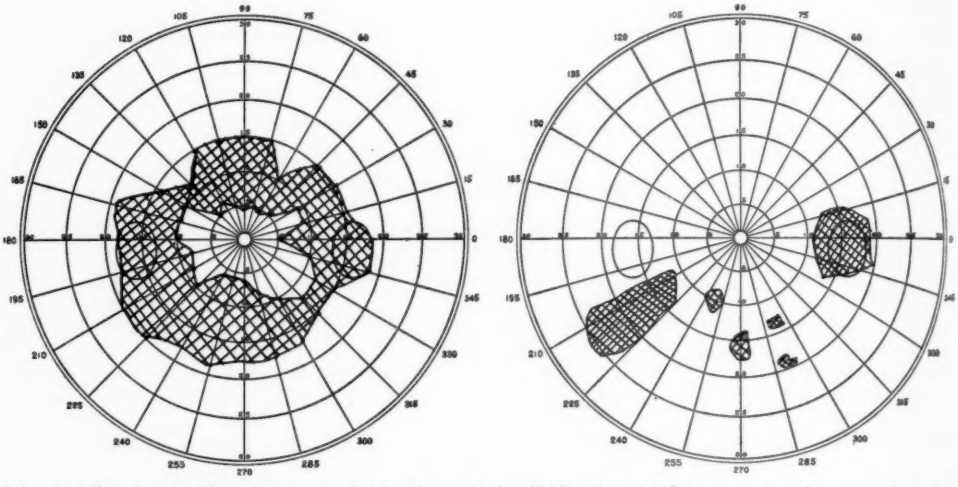


Fig. 1 (Callahan). Central visual fields charted April 17, 1939, 1/2° target, showing complete ring scotoma in the left eye and partial ring in the right eye.

In 1895, Ole Bull,[1] in his classic, "Perimetrie," called attention to the complete or partial, sometimes irregular, winglike or crescentic arcuate or annular scotomata, which he regarded as practically pathognomonic of syphilis. A certain number of these are probably nerve-fiber-bundle defects due to damage to the inner retinal layers from the associated disease of branches of the central retinal artery; nevertheless, the exact *modus operandi* of this peculiar abnormality has never been established. A few years later, Gonin[2] and Nettleship[3] reported a few cases and expressed the hypothesis that the cause was neurogenic in origin, and since that time various authors have veered from one assumption to the other.

During the past three decades very little has appeared on this subject. Claiborne,[4, 5] in 1915, reported a case of ring scotomata from chorioretinitis syphilitica, but no field studies were made, and the diagnosis of syphilis was not established. Favory,[6] in 1928, mentions a case in relationship to several others, but presented no detailed consideration and omitted all but several conclusions.

CASE REPORT

A white man, aged 42 years, presented himself on April 17, 1939, complaining of poor vision and headaches of increas-

ing severity. Vision was especially poor at night, and he had difficulty in walking down the dimly lit hallway of his home. His wife stated that he drank alcohol and beer immoderately, and they both believed that he needed glasses; he denied venereal infection.

Vision in the right eye was 20/80 and in the left eye 20/25. The external appearance of both eyes was normal; the pupils reacted quickly to accommodation and sluggishly to light. Muscle tests showed orthophoria, and the tension of each eye was 20 mm. Hg. Manifest refraction showed the impossibility of improving the vision with lenses. Ophthalmoscopic examination revealed the fundus of the right eye to be hazy; the nasal portion of the disc was slightly blurred. The appearance of all vessels was normal, and there was no evidence of abnormality in the left eye.

The central fields were charted (April 17, 1939) and a complete ring scotoma was found to be present in the left eye;

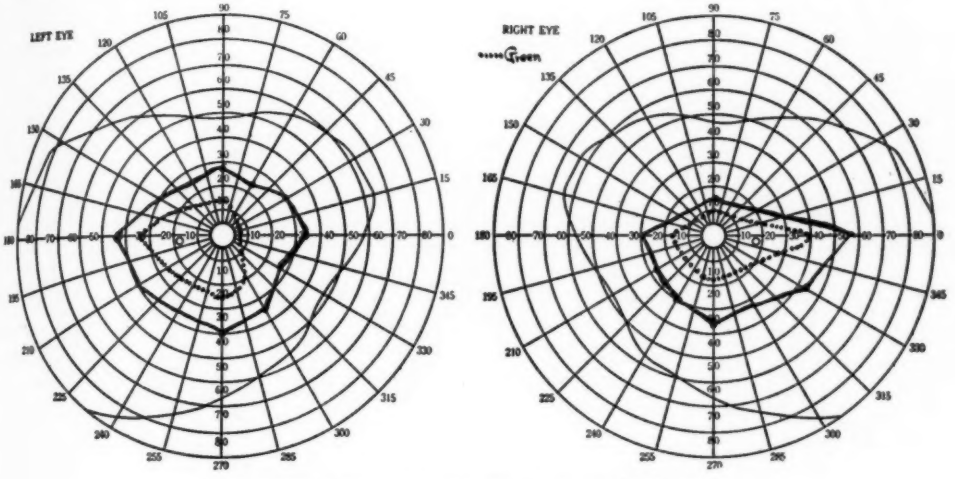


Fig. 2 (Callahan). Visual fields on April 18, 1939.

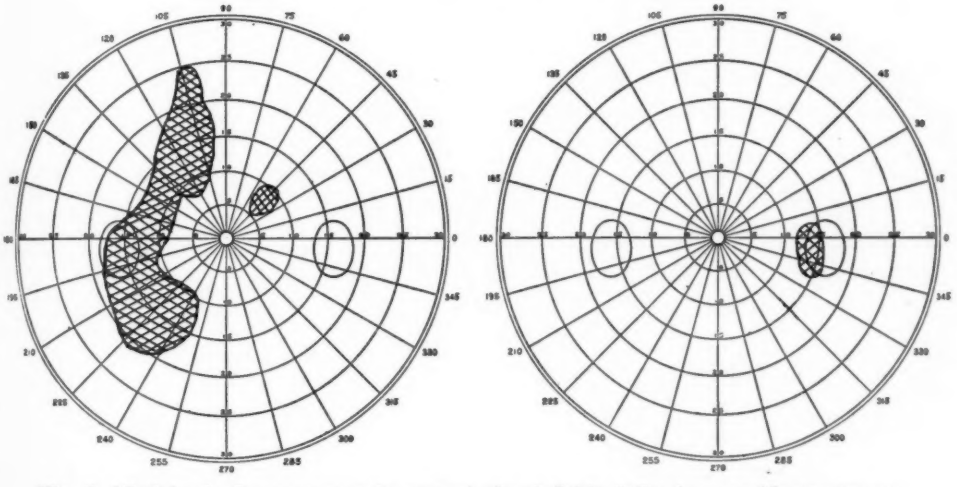
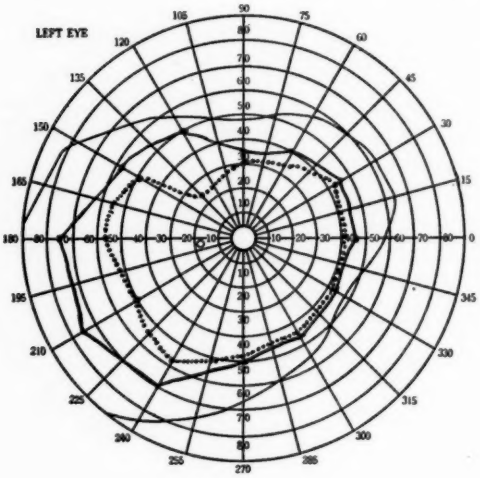


Fig. 3 (Callahan). Improvement in central visual fields following specific treatment, April 20, 1939, 1/2° target.

an incomplete ring in the right eye (fig. 1). Visual fields when charted the next morning were found to be contracted to almost 30 degrees in each eye (fig. 2).

Complete physical examination, including neurological studies, failed to disclose any etiological factor; blood for a Wassermann test was taken but before results were reported, on April 19th, 0.3 gr. neoarsphenamine was given i.v. and 1 c.c. of bismuth i.m. was administered.

Two days later, the patient reported himself to be vastly improved, and this was corroborated by the central fields (fig. 3). A strongly positive Wassermann reaction was reported later in the same day, and on April 24th, 0.45 c.c. of neoarsphenamine i.v. and 1 c.c. of thiobismol i.m. were given. The peripheral fields on that day (figs. 4, 5), showed marked enlargement with considerable reduction in the size of the scotoma. By April 26th, they had almost disappeared. On May 1st, the visual acuity had improved to 20/40— in the right eye, 20/20 in the left. On May 8th, 0.6 gm. of neo-



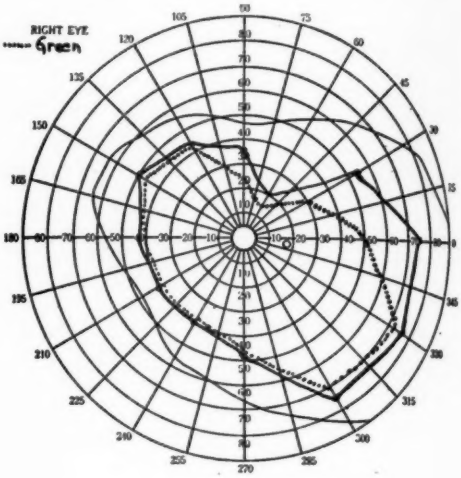


Fig. 4 (Callahan) above. Further improvement of visual fields, as of April 24, 1939.

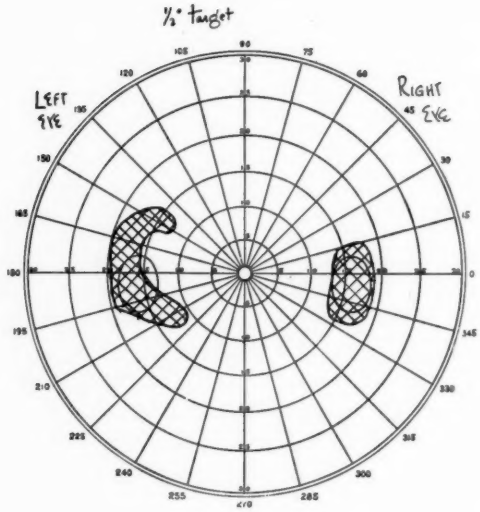


Fig. 5 (Callahan) left. Remnant of scotoma, ½° target, in left and right eyes.

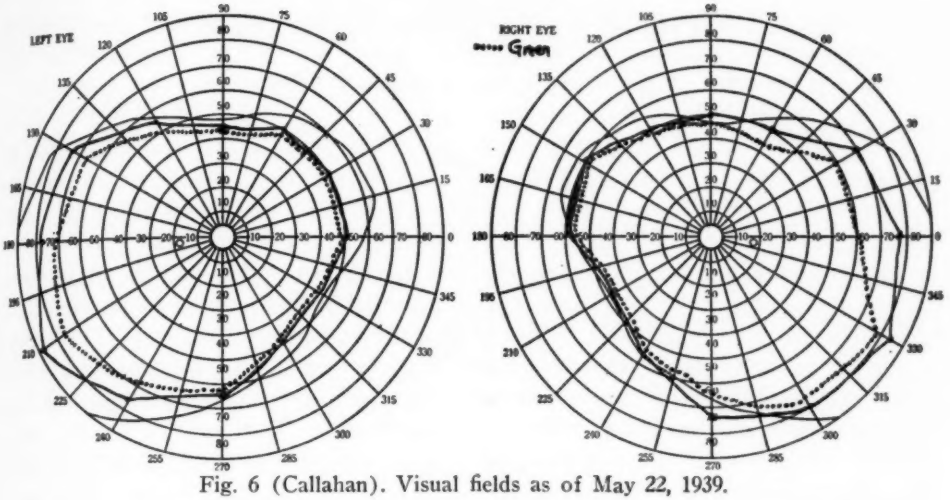


Fig. 6 (Callahan). Visual fields as of May 22, 1939.

arsphenamine i.v. and 1 c.c. of thio-bismol were administered and continued at weekly intervals. By May 22d, the limits of the peripheral field had returned and were almost normal (fig. 6); by August 2d, the blind spots were small and eccentrically placed and the acuity was 20/20 in the right eye, 20/20 in the left (fig. 7). The patient has continued the antisyphilitic treatment without interruption until the present time, and the headaches and ocular symptoms have long since disappeared.

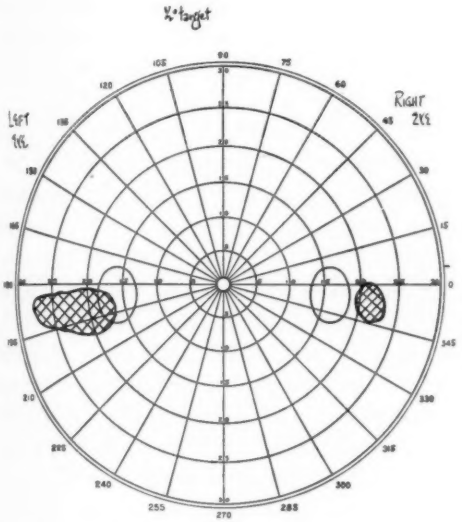


Fig. 7 (Callahan). Central field showing blind spots small and eccentrically placed, August 2, 1939. Visual acuity, left eye, 20/20.

Discussion. The rapidity and manner with which the scotomata disappeared and the visual fields enlarged must unquestionably be related directly to the circulatory system of the eyes, and cannot plausibly be explained in any other fashion. This would seem to exclude the possible tenancy of the theory that syphilitic scotomata are due to a degenerative lesion of the neurones.

First National Bank Building.

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SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

December 19, 1939

Dr. J. Herbert Waite, *presiding*

Observations on heterochromia iridis

Dr. F. A. Simeone said that the question of the causative relationship between cervical sympathetic paralysis and heterochromia iridis was still an unsolved problem. Six cases were described to illustrate different types of heterochromia iridis with Horner's syndrome. One of these was associated with Romberg's facial hemiatrophy and another was the result of cervical sympathetic paralysis following birth injury to the brachial plexus. Four other patients were presented with lesions of the cervical sympathetic arising during adult life. Only one of these, seven years after superior cervical ganglionectomy, showed any decrease in the amount of pigment in the denervated iris as compared with the normal. Indeed, one observer considered the difference to be within the limits of normal variation.

Experimental observations were reported in four dogs in which unilateral Horner's syndromes were induced at the ages of one to two weeks by reaction of the stellate ganglion followed later by resection of the ipsilateral superior cervical ganglion. All four dogs developed brown pigmentation of the irides and, grossly, no difference could be detected in the amount of iris pigment in normal and denervated irides 10 and 12 months after operation. Two of the dogs showed no histological evidence of difference in pigmentation. A third dog showed less pigment in the denervated than in the normal iris. The fourth dog had not yet been studied histologically. With only one of the three dogs showing less pigment in the denervated than in the normal iris, the possibility of this being a normal variation could not be excluded.

It was concluded that the majority of cases of heterochromia iridis can readily be explained as instances of Bremer's status dysraphicus. The case of birth injury with cervical sympathetic paralysis and lack of pigmentation in the corresponding iris, however, can hardly be explained on the same basis. It could be attributed to trauma inflicted upon the eye, but until further negative experimental evidence is obtained it is impossible to deny that the failure of pigmentation could be due to lack of sympathetic influence on the iris stroma.

Neuro-ophthalmological subjects

Dr. Virgil Casten read a paper regarding the above. Neuromyelitis optica was one of the subjects. Dr. Casten said that in 1879 Clifford Allbutt first described the occurrence of bilateral optic neuritis with acute myelitis (Lancet, 1870, v. 1, p. 76). In 1927, Beck found reports of 70 cases in the literature. In 36 cases myelitis preceded ocular symptoms and in 18 cases the first symptom was the onset of blindness. Perritt states the mortality to be 50 percent. He found optic neuritis preceded the myelitis in nearly three fourths of the cases. Both eyes are usually involved, rarely simultaneously; the interval ranges from a few hours to several weeks. Pain in or about the eye is not the rule. Extraocular palsies are not usual. Neither the pupils nor their reactions are distinctive. The fundi have the same appearance that is found in so-called acute retrobulbar neuritis, normal to low degree of papilledema. Visual fields are not characteristic. Nystagmus is infrequent. Para-

plegia is usually present, first in one leg then in the other. There may be signs of a transverse myelitis, a diffuse myelitis, or an ascending myelitis.

Dr. Casten stated that in differentiating neuromyelitis optica from multiple sclerosis, the former may occur at any age even under the age of 10 years. Disturbances of vision are bilateral and often progress rapidly to complete blindness. Pain in the extremities is common. Remissions are infrequent. The cerebellum or other cranial nerves are practically never attacked. However, in multiple sclerosis the cranial nerves are frequently involved, remissions are the rule. The condition comes on at puberty or later; rarely are both eyes involved; pain is infrequent, and numbness is quite common.

Dr. Casten reported a case of a 38-year-old German-American musician whose chief complaint was weakness and numbness of the left leg, failing vision in the right eye. During the month preceding admission this weakness and numbness of the leg became progressively worse so that at the time of examination the leg was almost useless. He also experienced some burning sensation of hands and feet. For a week before admission he noticed failing vision in the right eye which progressed so that he could not identify any objects definitely but could tell light from dark. There had been no headache, vertigo, nausea nor vomiting, and no double vision, but during the month before admission he had had constipation and some slight difficulty in starting the urinary stream.

His temperature on admission was 99.2°F., pulse rate 65, and respirations 20. Physical examination showed a mentally alert man. There was no objective speech disturbance. With the right eye the patient could count fingers at five feet eccentrically; in the left eye vision was 20/20. The pupil of the right eye was larger than that of the left; it reacted poorly to light; normal reactions were elicited from the pupil of the left eye. The extraocular-muscle tests were negative; no diplopia. The visual field of the left eye was normal, that of the right showed a 25-degree central scotoma for a 35-mm. white test object. There was no pain on moving the eye at any time, and no pain on pressure. Finger-to-nose test showed some inaccuracy on the left. Arm reflexes were somewhat diminished and no abdominal reflexes were present. Deep reflexes were present but diminished and about equal on two sides. Cremasteric reflexes were diminished. Ankle jerks were not obtained. Plantar response was Babinski in type. The white-cell count on admission was 7,000 with 66 percent polymorphonuclears. The red-cell count was five million with a hemoglobin of 101. Urinalysis showed a specific gravity of 1.013 with no albumin, no sugar, and with 0 to 1 leukocytes and rare epithelial cells. A lumbar puncture, made the day after admission, showed a clear colorless cerebrospinal fluid with initial pressure of 110 and a combined jugular of 250, with a fairly prompt rise and fall. After 10 c.c. cerebrospinal fluid was removed, the pressure was 60. There were 10 erythrocytes per cubic millimeter and total protein of 72 mg. percent. The colloidal gold curve was 0011000000. A spinal fluid examination six days after admission again showed a clear fluid with 71 mg. percent total protein and 10 erythrocytes, 3 polymorphonuclears, and 16 lymphocytes per cubic millimeter. An ocular examination 10 days after admission showed questionable light perception in the right eye; with the left eye fingers could be counted at 18 inches in the nasal field. The pupil of the right eye did not react to light; that of the left was a little larger and did react fairly well to light. Both reacted to convergence. The fundi were normal. There was no visual field in the right eye; large scotoma (central)

was present for the left eye with retention of periphery of field, better on the nasal side.

The patient continued downhill, finally developing a complete quadriplegia, and died on the 33d day after admission. The autopsy was negative except for the central nervous system, which showed complete demyelinization of the intracranial portion of the optic nerves with perivascular infiltration and degeneration of the axis cylinders, also numerous other areas scattered throughout the brain.

Dr. Casten said the so-called demyelinating diseases of the nervous system have very important ophthalmological aspects. In this group are included disseminated (multiple) sclerosis, acute disseminated encephalomyelitis, neuromyelitis optica (Devic's disease), and encephalitis periaxialis diffusa (Schilder's disease). A review of the literature reveals much that is contradictory. Clinical identification is used rather than etiologic evidence, for their clinical differences are due merely to degrees of involvement or predilection for special tissue. It is believed that these diseases are of infectious origin and probably due to a neurotropic virus that travels by either the blood stream or central-nervous-system fluid. All show common pathological points—namely perivascular infiltration, demyelinization, degeneration of the axis cylinders, and glial activity.

Involvement of the optic nerves, chiasm, and optic tracts may occur in all these diseases. Since these are brain tracts, it is possible the etiologic agent may have a special affinity for them as the other cranial nerves seem to be spared.

Adie's syndrome

Dr. Virgil Casten presented a case of Adie's syndrome in a 25-year-old male clerk, with bilateral tonic pupils. To ordinary examination the reaction to direct and indirect light appeared to be almost completely absent. However, on continued exposure to bright light, after some delay, the pupils contracted slowly. The pupils dilated after 15 minutes in the dark room. Accommodation was markedly reduced in each eye when pupils were dilated but were normal when pupils were contracted. A drop of weak pilocarpine would bring back the accommodation in a very few minutes.

Dr. Casten said that in 1932 Adie characterized the syndrome as "a benign disorder sui genera." The symptom complex of absent deep tendon reflexes and tonic pupils is called Adie's syndrome. The tonic pupil is definitely different and should not be confused with the Argyll-Robertson pupil, which is miotic. The latter is associated with syphilis, the tonic pupil never is.

Multiple sclerosis

Two patients with lesions in the supranuclear optic pathways were also discussed by Dr. Casten. Both patients were about 20 years of age, had crossed diplopia, complete paralysis of the internal recti for lateral associated movement only, and paresis of the external recti with coarse nystagmus limited to the external recti. Normal convergence was present in each. Both patients had other signs of multiple sclerosis.

Dr. Casten said there is a definite syndrome (a syndrome found in multiple sclerosis was described by S. A. K. Wilson in 1906) which is characterized by two features: (1) A decrease of lateral associated movement, which is unequal in the two eyes, with paralysis of the internal rectus and only paresis of the external rectus. (2) Nystagmus in the external rectus only, which is slow, coarse, and of large amplitude. Normal convergence is present despite the fact that the internal recti do not move beyond the mid-line for conjugate gaze.

Recent studies of Scala and Spiegel

on the cortico-nuclear pathway for horizontal ocular movements show that the nervous impulses pass from the cortex to the eyes through the vestibular nuclei. The fibers from the cortex go to the reticular substance of the pons, from there to the vestibular nuclei, from there to the horizontal-gaze center and sixth nucleus. They then pass up through the postlongitudinal bundle and cross to the nuclear center of the internal rectus. Thus a lesion in the postlongitudinal bundle, lying between the levels of the abducens and oculomotor nuclei (internuclear ophthalmoplegia), would cause paralysis of the internal-rectus muscles for conjugate action (Spiller). The more caudal the lesion is in the bundle, the more likely are the centers for horizontal gaze to be affected in addition to the palsy of the internal-rectus muscle.

VIRGIL G. CASTEN,
Recorder.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

December 4, 1939

DR. ARTHUR M. YUDKIN, *presiding*

SYMPOSIUM ON PLASTIC SURGERY DEDICATED TO THE MEMORY OF THE LATE DR. ISADORE GOLDSTEIN, ONE OF THE FOUNDERS OF THIS SOCIETY

CORRECTION OF LID COLOBOMATA

DR. EDMUND B. SPAETH of Philadelphia said that variations in the procedure in all these cases depended on the presence or absence of the eyeball. If absent it is permissible to ultilize skin epithelium to replace the posterior surface of the corrected lid. If the globe is present epithelium would cause a severe, intractable keratitis, and mucous membrane must be used.

Congenital colobomata of the upper lid are well corrected by a procedure outlined by the late Dr. Wheeler in his "halving operation." The result may be improved by a canthotomy, the transection of all of the orbicularis fibers, and the resection of a small triangle from the lower lid at the outer canthus—all through the same canthotomy incision.

Congenital colobomata of the lower lid usually lie at the inner angle and hence are more difficult to correct. In these it is necessary to move tissue about. One must either utilize a V-Y incision or some modification of Siklosy's incision line. When the coloboma is nearer the external angle, Axenfeld's modification of the Dieffenbach operation may be used; or the Esser technique, that is, the transplantation of a full-thickness triangular flap from the upper lid into the lower-lid defect.

Colobomata following malignancy, if the eyeball is intact, are best corrected by a pedicle flap which has at its correcting head a mucous-membrane graft previously placed at that point on the face or forehead from which the correcting flap is to be lifted. In the lower lid a similar technique, the Hughes operation, or a simple sliding graft may be used.

In traumatic colobomata of the lids with an absent eyeball, an extensive pedicle-flap operation may be needed in some instances. Cases of lesser severity can be corrected by resection, pedicle flap, and free skin graft, perhaps, from the upper lid of the opposite eye. Others may only need scar resection and suturing.

Discussion. Dr. Wendell L. Hughes said that he had never transplanted any of the Esser grafts from the upper lid to the lower margin of the lid as described by Dr. Spaeth. But he would like to know what Dr. Spaeth's experience has been in regard to the upper lid. He asked how he bridged over the lashes in the upper lid when transplanting to the lower lid.

Dr. Spaeth replied that when grafting

from the lower to the upper lid the procedure is done in a 360-degree circle. Lashes are so inconsequential in the lower lid that it does not matter whether the hairs from the upper lid are resected when transplanting to the lower lid, or whether the upper lid graft is placed in the lower lid in such a way that the hairs form the lashes for the lower lid. For the upper lid, however, it is important that lashes be preserved.

Reconstruction of upper and lower lids using ear cartilage

Dr. Wendell L. Hughes traced the history of reconstruction surgery of the lids and then illustrated the operation by slides and motion pictures. The case reported was one in which the lids were so badly injured that there was no tarsus left in either lid of the right eye. Both eyes sustained perforating injuries and both corneae were entirely opaque. The right eye seemed to offer some hope of benefit from corneal transplantation, so it was decided to reconstruct these lids to protect the eye when this procedure was carried out.

There was almost complete symblepharon of both upper and lower lid of the right eye, and it was decided first to reconstruct the fornices by means of mucous-membrane grafts from the mouth. First, the lower lid was separated from the eye, and a piece of buccal mucous membrane was transplanted into the fornix and attached to the limbus and along the lid margin. Two double-armed sutures were then passed through the mucous membrane and skin from within out, in order to form the fornix. Two weeks later a similar procedure was carried out for the upper lid. It was noted that there was useful tarsus in neither upper nor lower lid.

The remains of the upper and lower lids were split transversely along their muco-cutaneous junction, and the edges of the upper and lower mucous-membrane layers representing the conjunctiva were united over the eye. A thin piece of ear cartilage, 3 cm. by 1.5 cm. was then removed and placed over this layer. The skin layers were closed over the cartilage and a pressure dressing applied. Three months later, July 10, 1939, two hair-bearing strips of skin were transplanted for lashes; one from the inner end of the same brow for the upper lid and the other from a symmetrical location in the opposite brow for the lower lid, on to the anterior surface of the cartilage.

After the lashes were seen to be growing well a new interpalpebral fissure was made by incising between the two rows of hairs through the skin-cartilage and mucous-membrane layers. The final condition one month later was good. A corneal-transplant operation was performed but the graft became opaque.

A new operation for spastic entropion

Dr. Raymond E. Meek presented a new surgical procedure for entropion which applies to cases not responding to simpler treatment. He emphasized the anatomical formation in the lids and the two directions of force which operate in the muscles of the lower lid. The orbicularis fibers of one set have their concavity directed toward the palpebral fissure. On contracting they pull up the lower lid and raise the skin. The muscle at the lid margin has its concavity directed backward, so that on contraction of these fibers the lower lid is pulled against the eye. In an empty socket, however, or after bandaging, or in the absence of fat in the aged with a deep-set eyeball these forces turn the lower eyelid back. Dr. Meek attempted to show how this condition could be corrected by changing the

course of the fibers of the muscle.

An incision the length of the lower lid is made, 3 mm. from its margin. The skin is undermined 1 mm. above the incision and 3 mm. below. The fibers of the orbicularis oculi 4 mm. wide are exposed. Two flaps of this muscle are now lifted up from each end. The center 7 mm. of the exposed muscle remains attached just temporal to the center of the lid. The two flaps are turned down and attached to the anterior surface of the inferior orbital margin through tunnels made with a knife. The temporal flap is sutured 25 degrees nasal to the center attached portion. These flaps are sutured to the periosteum either by plain 10-day catgut or by No. 1 silk coming out through the skin and tied over a peg. The skin is closed by interrupted black silk sutures.

Discussion. Dr. Percy Fridenberg called attention to the necessity of the study of biology, tissue mechanics, and to the requirement of architectural and constructional imagination for success in plastic surgery. Knowledge of history was also important as demonstrated by Dr. Hughes's paper.

Dr. Wendell L. Hughes stated that the mechanics of Dr. Meek's operation seemed very good and asked if Dr. Meek made any distinction as to the type of entropion in which this operation was best suited. Simple cases of spastic entropion, he felt, can be controlled by alcohol injections, but old cases of senile entropion, in which the fibers of the orbicularis are large and gathered into ropelike structures seen moving under the skin, have not been helped by injections and this seems an excellent procedure for such cases. He said he would like to make a plea for alcohol injections into the outer third of the orbicularis, because the patient cannot be harmed by it; it is a simple office procedure and very often will give permanent results. It may have to be repeated three or four times, but a great many patients would choose that rather than any major operative procedure. He added that he has found it very successful especially in cases that occur postoperatively. Before a patient is thoroughly prepared on the operating table, it can be noted if the lid has a tendency to turn in; if this is so, then is the time to make the alcohol injection.

Dr. Meek said that he had intended to speak of Dr. Hughes's alcohol-injection procedure since he found it to work beautifully in early cases. In old cases, however, the simple methods do not work, and in these obstinate cases he felt that his procedure is indicated.

Contributions of the late Dr. Goldstein to ophthalmic plastic surgery

Dr. Benjamin C. Rosenthal gave a brief review of this subject including: 1. Levator-recession technique for the treatment of stationary exophthalmos with lagophthalmos, by both conjunctival and skin routes. 2. Excision of tarsus with buccal-mucous-membrane transplant for intractable vernal catarrh. 3. Repair of epiblepharon by excision of a skin wedge. 4. Operation for retention of an artificial eye after exenteration of the orbit. This included lining of the bony cavity with Thiersch grafts, the building of new lids, and the formation of accessory lids to act as a diaphragm and give support to the artificial eye. 5. Correction of palpebral hernia by excision of the herniated orbital fat and the reinforcement of the tarsoörbital fascia.

Discussion. Dr. Jacques Maliniak of the Society of Plastic Surgeons said that in 1932 Dr. Goldstein assisted in organizing the Society of Plastic Surgeons. His quiet poise and ability to reason and observe were great. While Dr. Goldstein did not publish many of his ideas, they

were fortunate to hear of many directly from him. He said he believed that plastic surgery in ophthalmology should belong to the ophthalmologist just as plastic surgery in neurology should belong to the neurologist.

Mrs. Hazel P. Francisco, director of nursing service at the New York Eye and Ear Infirmary, said that she wished in the name of the infirmary to pay respect to the memory of Dr. Goldstein. She added that his kindness and his teachings will never be forgotten.

Sidney A. Fox,
Secretary.

SAINT LOUIS OPHTHALMIC SOCIETY

January 26, 1940

Dr. B. Y. Alvis, *president*

The sterilization of sharp instruments (further studies)

Dr. M. H. Post presented a paper on this subject which will be published in this Journal.

Discussion. Dr. L. A. Julianelle said in the sterilization of instruments, it seemed to him that the desired end is first to destroy bacteria and secondly to preserve the fineness of the instrument. That 2-percent lysol does destroy organisms is not surprising, since lysol is such a good germicide; the problem resolves itself into the damage done to the instruments. The lantern slides of the knives after prolonged immersion in the disinfecting solutions show that the second desired result has been achieved by Dr. Post. It must be remembered that the photographs illustrate the knife edge as seen through a microscope, so that a minute effect, unperceived by the naked eye, would be readily seen after the magnification.

He believes that two of the solutions are to be successful for the purpose of antisepsis and preservation of the instruments. In this regard it may be worth while to point out that Dr. Post has imposed upon himself a difficult and exaggerated condition when he tested the effect of the antiseptic solutions in the presence of 1-percent blood serum and 5-percent whole blood. No doubt this amount of protein contamination is far in excess of that created by carrying over into the solution blood which may be adherent to the instruments. Since the activity of the antiseptic was not retarded or decreased under these conditions, it seems fair to conclude that the solutions should be effective under the usual working conditions.

Dr. M. H. Post said in closing that he was sorry if his remarks seemed to belittle the value of the microscopic pictures. They are difficult to make, and Mr. Moore made quite a number in order to get the pictures shown. Regarding the sterilizing of sutures, we recommend that they be boiled, though it is possible to sterilize them in this solution. The solution should be changed daily. The loss, by evaporation, of the chloroform and abolene will not disturb the germicidal value of the solution. He did not know the cost of the solution. With regard to the treatment of the instruments upon removing them from the solution, he believes that the best practice is to wipe them off carefully with cotton, after which they are ready for use. If desired, they may be immersed in sterile water for a moment and then carefully wiped dry with cotton. Care should be taken that no solution is carried into the eye.

Spontaneous anterior dislocation of lens

Dr. Vincent L. Jones presented a communication on this subject.

Adolph C. Lange,
Editor.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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BILATERAL CATARACT OPERATION

The hesitation with which most ophthalmologists approach the problem of performing a cataract extraction upon an only eye—the vision of the other eye having been already lost beyond hope of recovery—is based upon the fact that the operation, if undertaken, will represent the patient's last chance for useful vision. Many a patient has lived for years with no more than light perception because his physician always pointed out—perhaps too conscientiously—that against the hope of excellent vision must be balanced the possibility of losing that remaining sense of contact with the visual world which depends upon the ability to distinguish between light and darkness.

Almost the same sense of responsibility, the same hesitation to face the alternative between losing all and winning all has restrained a great majority of ophthalmologists from performing the cataract operation upon both eyes of the same patient at a single sitting. The fear of staking all upon the surgeon's steadiness of hand and eye, and upon the patients' nervous reactions and general condition of health, on that one fateful day, is too much for most of us.

Among those who in the literature have advised against the bilateral procedure

may be mentioned Herman Knapp, the elder Beard, MacKenzie, Fuchs, Arlt, Terson, Terrien, Czermak, Hirschberg, and Yanes. Beard called it "the height of folly." Terson was "unconditionally" against the method.

The dangers emphasized by various writers are such as would suggest themselves to most of us, namely bilateral ophthalmia and bilateral expulsive hemorrhage. The critics contrast with these dangers of the bilateral operation the positive advantage of learning at a single operation facts which may add to the patient's safety in an operation on the second eye.

Yet a number of experienced and skillful ophthalmic surgeons have practiced and recommended the bilateral operation. Even its opponents admit that it is simpler and less expensive for the patient. Many elderly patients dislike the idea of a second hospitalization and a second visit to the operating room.

It is also argued that bilateral loss of vision, even from infection or expulsive hemorrhage, almost never happens. It is further suggested that after failure of operation on the first eye the majority of patients refuse operation on the second eye, and so often remain permanently blind.

Elschnig, who favored and very generally practiced the bilateral operation, accepted as contraindication to such a procedure the following conditions: psychotic or exaggerated nervous tendencies in the patient; advanced arteriosclerosis; and any serious complication occurring during the operation on the first eye, especially loss of vitreous.

De Wecker, who in general thought safer not to operate bilaterally, nevertheless made it a matter of record that he operated at the same session on every patient with bilateral mature cataract in order to avoid the drawbacks of two operations at a longer interval of time. He confirmed the experience of others that infection in both eyes was very rare. He added that where the two operations were done at different times it was not extremely unusual to have the same mishap occur in both eyes, in spite of the utmost care to profit from knowledge gained in the first operation.

Vajda, in a total series of 296 cataract extractions, reported forty bilateral operations without serious complication.

Mulock Houwer, who is working chiefly among Malays, in the island of Java, reviews the opinion and experiences of various authors, and then reports the results with the bilateral procedure in 117 patients of his own Batavia clinic (Ophthalmologica, 1940, volume 99, page 269).

The world economic crisis of 1932 caused the government of the Netherlands Indies to make a drastic reduction in expenditures, so that the number of beds at the disposal of the eye department was reduced from ninety to sixty-five, in spite of the fact that even in normal times there had been a shortage of accommodation.

It had previously been the custom to operate on the second eye (when necessary) two weeks after the first, so that the patient had to spend at least four weeks in the hospital. Economic necessity, and shortage of beds, induced Mulock Houwer to resort to the procedure of operating on two eyes on the same day whenever the circumstances seemed to justify this action, and he says that the method has been used ever since to the great satisfaction of those in charge of the clinic.

Every cataract patient is operated upon bilaterally when the better eye no longer has useful vision. The natives generally do not come for operation with vision of more than 1/60 in the better eye. Many of the patients have trachoma in the later stages, and this is treated until the condi-

tion of the conjunctiva is such that no further benefit is to be expected within a reasonable length of time.

Many of the eyes operated upon in Mulock Houwer's clinic are, he says, "in a state that an eye surgeon in Europe or America would regard as a contraindication to operation." However, in general the natives show a relative immunity to miscellaneous infections. The double operation is no longer performed on diabetics.

About fifty percent of the operations are performed by the intracapsular technique: Two stitches are inserted in the conjunctival flap and a peripheral irridectomy is performed after extraction of the lens. During the past three years, the patient has been allowed to sit up in bed or in an easy chair for one hour in the afternoon of the day of operation; and he is gradually allowed more liberty. Perforated bandages are used after the first three days. Needling of aftercataract, where necessary, is done about two weeks after the principal operation.

Mulock Houwer classifies his results in three groups: good, moderate, and bad. Many of the patients have more or less corneal opacity, chiefly from trachoma, and the results are as good as the previous corneal condition would permit. Thus, an eye with corneal opacity from trachoma and a postoperative visual acuity of 1/6 may be counted among the good cases, while another eye with a perfectly clear cornea before operation and a postoperative visual acuity of 1/3 is placed in the "moderate" group.

Of the 117 patients upon whom the double operation was performed, 99 (85 percent) obtained good results in both eyes. In 114 cases (over 97 percent) at least one eye was good.

Certain lessons may be deduced from the unsuccessful or partly unsuccessful cases. One patient died from pneumonia complicating a psychic disturbance, both conditions being attributed to inadequate nursing and the use of a depressant drug (somnifen).

The one patient who lost the sight of both eyes had diabetes and albuminuria. He had had preliminary care in the medical department for nine days. After two days he developed an infection in the right eye, on which intracapsular extraction had been performed with rupture and forceps extraction of the capsule. After eleven days he was again, for about five days, under the care of the medical department, this time for amebic dysentery which had become manifest in the interim; and during that time he developed persistent hemorrhages in the left anterior chamber. This case was the cause of abandonment of the bilateral policy as regards diabetics.

The cause of failure in the four cases that had good vision on one side and bad on the other were respectively opacity of the cornea due to trauma in needling, opacity of the vitreous of uncertain origin, epithelial proliferation in the anterior chamber, and panophthalmitis. The author remarks that these four patients all left the hospital cheerful and thankful, whereas if they had been operated upon unilaterally a half of them would presumably have remained blind for the rest of their lives, since either the patient or the surgeon would have lacked courage for an operation on the second eye.

On the one hand a saving in expense and convenience, and perhaps in some cases the avoidance of blindness due to fear of failure in the second eye after failure in the first. On the other hand the feeling that experience gained at the first operation may protect the patient against a second failure, if he be unlucky enough to fail at a first attempt. Statistically, Mulock Houwer makes a good case for the bilateral method. Yet, notwithstanding the arguments which can quite logically be adduced in favor of operating upon

both eyes on the same day, most surgeons whose work is done with a deep sense of responsibility to the patient will probably continue to shrink from the risk of overwhelming disaster which they associate with the bilateral procedure.

W. H. Crisp.

THE SELECTIVE DRAFT AND MEDICAL PREPAREDNESS

It is barely possible, although unlikely, that by the time this editorial is printed the problems to be discussed will have been settled.

In its eagerness to make the Selective Draft truly democratic, the Draft Board, through it director, Dr. C. A. Dykstra, offered no assurance that young doctors or dentists would be able to practice their profession while under military training. In other words "no occupational deferments are being contemplated." If the young doctor or dentist wishes to avoid a more or less wasteful year, wasteful to him and to the civilian population later, he can escape this term of marching, gun-toting, and potato peeling, by signing up in the Medical Reserve Corps. Many have done so, which is right, because the army needs physicians badly and it is the duty of organized medicine to supply this demand as quickly as possible. Nevertheless, in effect, the Draft Board says "if you don't want to be a buck-private, you must get into the Reserve Corps before it is too late." This applies to the intern and residents as well as to the young man just established in practice.

Although the enlistment of medical students is being deferred until July, from then on they are liable to induction. One can readily see how prodigal is this policy of adjourning for one year the training of future physicians who will be urgently needed for both the civil and especially the military populations. It all sounds like the story of the insane passerby, who said to the house painter high up on the ladder, "Hang onto the handle of your brush, I'm borrowing your ladder for a little while." It is no wonder that the eligible young medical man's mind is in a state of chaos, that hospitals and medical schools are in a quandary.

If occupational deferment is undemocratic, is occupational preferment likewise so? It is not only democratic, but division of labor is a law of nature. It is common sense that the race horse should not be made to pull a plough, the army cook to aim and fire a gun, the navigation officer to stoke the boilers. Even the convict in prison is given work to which he is suited.

If it is necessary to draft the young doctor, he should be drafted into the Medical Corps. If he is an intern or resident, a place should be found for him in one of the many army medical hospitals and credit given him by the special examining boards for this year of training. It is unbelievable that some such arrangement will not eventually be carried out. But, so far, the Draft Board has given no sign of it.

The draft has affected many physicians, and particularly ophthalmologists, too old or otherwse ineligible for induction. These men are placed in responsible and indispensable positions on local boards of draft examinations. They serve without pay, and proudly donate not only their services but also the use of their offices, office help and costly equipment to the nation's need. All of them are busy, and some are overworked with important, necessary, and decisive examinations. He who has tried to detect and expose ocular malingering knows what hard work it can be. It would be only fair and just if a grateful government would allow these physicians to deduct from their income-

tax returns a sum, say from three to five dollars, for each draftee examined. This would not be a fee in the ordinary sense, but would constitute recognition, although negative, for services rendered.

Derrick Vail.

BOOK NOTICES

MEDICOLEGAL OPHTHALMOLOGY. By Albert C Snell, M.D. Clothbound, 312 pages. Published by the C. V. Mosby Company, Saint Louis, Missouri. 1940.

Trial by jury remains a contest of legal wits and often justice is not done.

Most physicians who do not make industrial consultations a feature of their practice, and are therefore unfamiliar with legal procedures, find themselves in an uncomfortable situation between lawyers, one of whom is trying to guide them to make statements for the benefit of the plaintiff and the other equally anxious to trip them into damaging admissions or statements that may invalidate their testimony. A grossly unqualified assemblage of "The butcher, the baker, the candle stick maker" may listen for days to technical evidence for the understanding of which years of study would be needed.

After an hour or more of cross-questioning the physician leaves the stand fully aware that failures of the lawyers on one side or the other have prevented development of the evidence in a manner that could possibly give to the jury the true merits of the case.

Usually if he has been called by the defense the physician's chance of being paid a reasonable fee is good, but if called by the plaintiff he usually gets nothing.

On the other hand appearances before the industrial commissions are far more satisfactory. The commissioner is usually well informed and is obviously trying to settle the case as fairly as possible. He welcomes all the information that he can get and is able to render a far more equitable judgment than any jury, be they ever such good men and true.

The better versed the physician is in medicolegal matters the less uncomfortable he will feel when testifying and the more satisfaction he will get out of this element of his practice. Those familiar with this type of work and who do it as a routine find it not only enjoyable but remunerative. It should be studied in all of its phases by any who are likely to need the information, and no one can be sure that he will not have occasion to use it. Dr. Albert Snell has presented in this treatise a splendid résumé of the subject.

The book is divided into three parts: Part 1—Some essential principals of medical jurisprudence and an analysis of compensation laws as these relate to visual disabilities. Part 2—Evaluation of visual disabilities. The determination of fractional parts of vision. Part 3—Practical application of the visual efficiency computation to medicolegal practice.

Chapter 1 opens interestingly, giving the essence of the subject of the relationship of the medical witness and the court. Such matters as the nature of privileged communications are discussed. Thereafter follows a consideration of that ever present nightmare, malpractice. The extent of its absurdities is scarcely a protection from the unhappiness that may be occasioned to one's self or one's confrères. The writer has no difficulty recalling a legal action brought against him 12 years ago for an operation which he did not even perform but which occurred on his hospital service. At present he must testify in a malpractice suit in which a dentist is alleged to have caused a retinal detachment by too hard hammering on a tooth. It is well to know one's liabilities

and surely the young physician needs a guide on this subject.

Chapter 4 is historical and chapter 5 has to do with state and federal compensation laws. The disadvantage of state individuality in the matter is clearly brought out. The reader, however, cannot be relieved of the necessity of knowing the quirks of compensation laws in his own state by reading this book because, obviously, the idiosyncrasies of 48 state laws cannot well be condensed in a readable volume.

The last chapter involves analysis of the various methods of evaluating disability that have been proposed. The author is well qualified to write on this subject because he served as a member of the committee of three that spent years in studying the subject and presenting a formula that was accepted by the national bodies. This is the one currently in use and on it are based the state laws with their minor variations. This chapter presents the subject very adequately.

There is a good chapter on examination of cases of injured eyes and another on malingering. The best known tests are clearly stated.

The last chapter points out improvements that might be made in compensation laws. The appendix gives excerpts from court decisions. There is a bibliography and excellent index.

The book is very well written and presents the entire subject in a masterly manner.

It is recommended for every ophthalmologist.

Lawrence T. Post.

THE 1940 YEAR BOOK OF THE EYE, EAR, NOSE, AND THROAT. Edited by L. Bothman and S. J. Crowe, with the collaboration of E. W. Hagens. Clothbound, 155 illustrations, 599 pages, price $2.50. Published by the Year Book Publishers, Inc., Chicago.

The appearance of this volume celebrates the fortieth anniversary of the useful "Practical medicine series." In the interesting anniversary preface the publishers describe the ofttimes stormy career of the series. "The Eye, Ear, Nose, and Throat Year Book antedated the series as a whole and provided both the inspiration and the fundamental plan from which the series started." It was established in 1901 by Gustavus P. Head, professor of laryngology and rhinology at the Chicago Post-Graduate Medical School. Casey A. Wood, from 1901-1925, Charles P. Small, from 1926-1930, and E. V. L. Brown, from 1930-1939, were the editors of the section of "The eye." During these years the small handy-sized volumes have played a useful role in ophthalmic literature. The abstracts were, as a rule, well chosen and well illustrated, and the terse editorial comments were frequently the most valuable contributions.

The present editor, Louis Bothman, continues the admirable work. The section on the eye consists of 336 pages of short but adequate abstracts of ophthalmic articles that have appeared in many foreign and domestic journals during the past year. The year book is a valuable addition to the ophthalmologist's library and permits of quick reference to literature which otherwise might not be available or which might have been overlooked.

Derrick Vail.

OBITUARY

EMORY HILL

1883-1940

On December 4, 1940, Emory Hill, one of our outstanding ophthalmologists, died after a very brief illness.

This leader in ophthalmology was born in Scottsville, Albemarle County, Virginia, on September 8, 1883. His ancestry was a notable one, and he inherited the finer qualities of the old Virginia families. He was educated in the schools of his county, later receiving his Bachelor of Arts degree from Columbia University. He then returned to Richmond, where he taught English at an institution to help obtain his professional education at the Medical College of Virginia. From there he went to wider fields to perfect himself in the specialty of ophthalmology, and at that time no better place than Philadelphia could be found to begin his training. He first went to the Infirmary for Nervous Diseases and later to the Wills Eye Hospital. At these places he came under the tutelage of such men as S. Weir Mitchell, George E. de Schweinitz, Frank Fisher, Charles A. Oliver, Samuel D. Risley, Conrad Berens, Sr., P. N. K. Schwenk, McCluney Radcliffe, S. Lewis Ziegler, William Zentmayer, William Campbell Posey, and Paul J. Pontius—men whose names remain fresh in our memories as the best in neurology and ophthalmology. From among this group some of his most lasting friendships were formed.

Having finished his training in Philadelphia, he became associated with Dr. Cassius Wescott in Chicago, serving as assistant in his office and as an instructor at Rush Medical College. He was gaining a large practice and a high reputation there, when certain of his friends in Richmond brought pressure to bear upon him to return to his native state and to his alma mater for practice and teaching. His only provision for acceptance was that he be allowed half of each day for clinical and laboratory work.

From Richmond the value of his abilities radiated to become nation-wide. Many honors were awarded him, but none pleased him more than his appointment as professor of ophthalmology in 1930 to succeed Dr. J. A. White. He was also quite proud of the honor that was conferred upon him by his fellow members in the American Ophthalmological Society in retaining him as their secretary from 1925 to 1932. He held membership in all of the national ophthalmological societies as well as those of his state and local societies.

Emory Hill

At one time he was a delegate from Virginia to the American Medical Association.

Emory Hill had a brilliant mind, quick in conception and clear in thought; he was at the same time an arduous and deep student. He not only read widely but he thought deeply; therefore, he was deceived by no one and he never deceived himself. He had the ability to express himself succinctly, frankly, and with absolute fearlessness. These faculties made

him an exceptional teacher, a wise counselor, a brilliant conversationalist, an outstanding physician, and a cultured and courageous gentleman.

He was so interested, so direct, and so truthful that he was sometimes misjudged as being harsh; yet no man had a heart more kind. He gave of his knowledge and of himself unsparingly when there was no hope of reward; even when ill, he would get out of bed uncomplainingly to see patients with minor conditions because he knew they did not seem insignificant to the sufferer.

Emory Hill was a devoted husband and father; while he reserved the intimacies of true friendship to a limited number, he was a most loyal friend. Fortunate were those who were able to commune with him on the footing of close friendship, and more particularly those who shared both his friendship and his daily association.

Robert H. Courtney.

CORRESPONDENCE

The relation of avitaminoses A and D to keratoconus

December 10, 1940

Editor,
American Journal of Ophthalmology:

On page 1093, second column, first paragraph of the October, 1940, issue of the Journal, Doctors Terry and Chisholm, in their article, "Studies on keratoconus relative to the effect of prolonged application of pressure," state: "Arthur A. Knapp has considered calcium deficiency associated with vitamin deficiencies an important cause of keratoconus." In the second paragraph the authors say, "Arthur A. Knapp, however, is convinced that vitamins A and D are most important in the etiology of keratoconus."

Doctors Terry and Chisholm are in error in their statements concerning my work. For, in none of my writings have I linked avitaminoses A and D alone, or along with calcium deficiency, as important causes of keratoconus. Nor have I said that I was convinced that vitamin D was most important in the etiology of keratoconus.

It might be well for me to point out that I have said that the vitamin-D–calcium-phosphorus metabolism is an important factor in the *development* of the cornea. I also have stated in my previous report that the regular decisive improvement of all the patients "suggests that the vitamin-D complex has a definite place in the therapy of keratoconus."

Shortly, I plan to have a further report on the vitamin-D–calcium-phosphorous metabolism in keratoconus.

(Signed) Arthur A. Knapp.

Dr. T. L. Terry's comment follows:

"Some good may have come out of our unintentional misinterpretation of Dr. Knapp's findings since he has so lucidly restated his opinions concerning vitamins and calcium-phoshorous metabolism in relation to keratoconus and to the development of the cornea."

(Signed) T. L. Terry,
Boston, Massachusetts.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP
ASSISTED BY DR. GEORGE A. FILMER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

1

GENERAL METHODS OF DIAGNOSIS

Barkan, Otto. **A diagnostic contact lens made of lucite.** Arch. of Ophth., 1940, v. 24, Oct., p. 798.

A lucite contact glass of the Koeppe type with a small detachable handle is described. This lens has an inherent magnification of 1.5, 50 percent more than that furnished by the loupe or corneal microscope. The lens is inexpensive but scratches easily.

J. Hewitt Judd.

Baudouin, A., Halbron, P., Fischgold, H., and Mion, R. Y. **Electric examination of the occipital region in lesions of the optic paths (changes of the rhythm of Berger).** Bull. Soc. d'Opht. de Paris, 1939, March, p. 176.

The authors report the results of preliminary work on the occipital electroencephalogram of normal man, in patients suffering from lesions of the optic paths and particularly in homonymous hemianopsia. The electro-encephalogram registers on the surface of the scalp the variations of potential originating in the cerebral cortex. According to Berger the electric oscillations in man are grouped in "alpha" and "beta" waves. As soon as the subject opens the eyes, after mental and sensory repose with eyes closed, the visual stimulus arrests the alpha waves which are replaced by the beta waves. Visual stimulation by attentive gaze constitutes the best means for arresting the alpha waves. When the stimulation ceases on closing the eyes, the alpha waves reappear. The authors present two clinical cases of bilateral lesions of the optic paths without complete blindness, a third with large central bilateral scotoma, one case of complete blindness, and two with unilateral lesions of the optic paths, Blindness, in spite of suppression of the visual functions, does not cause the Berger's rhythm to disappear. The authors found the phenomenon perfectly conserved in a case of disturbance of central vision by a lesion of the chiasm.

Jerome B. Thomas.

Bourbon, O. P. **Selection of the test object in perimetry.** Amer. Jour. Ophth., 1940, v. 23, Nov., pp. 1260-1261.

Campion, G. S. **Color photography of the fundus oculi.** Trans. Pacific Coast Oto-Ophth. Soc., 1939, 27th mtg., pp. 178-183.

Campion uses an old style Zeiss-Nordenson carbon-arc camera in making colored fundus photographs, apparently without too much technical difficulty. Lawrence G. Dunlap.

Friedman, Benjamin. **Ocular transilluminators.** Arch. of Ophth., 1940, v. 24, Oct., pp. 796-797.

Both curved and straight types of transilluminator are described. These carry a tiny 2-volt bulb at the tip and are adapted to fit into the handle of the standard ophthalmoscope. In the straight model the end tapers flush with the bulb, so that only 1.25 mm. of the glass is exposed. In the curved model an oval window, 1.5 by 1 mm., is cut near the tip. J. Hewitt Judd.

Grósz, István de. **The value of yellow light in ophthalmology.** Szemészet, 1940, v. 3, June, p. 15.

The author first discusses the value of monochromatic yellow light to automobile drivers. The short waves being excluded there is no dazzling, the pupil does not contract, contrast and visibility are greater, and visual acuity is increased. The yellow light is of great aid in diagnosis. The author uses the Zeiss vapor lamp and indirect ophthalmoscopy. The rays of greater wave length penetrate the layer of pigment epithelium, and changes in the choroid become visible (hemorrhage after contusion, exudation, drusen, sclerosis of the choroidal vessels). One is also able to measure the pressure in the vortex vein. Yellow-light ophthalmoscopy does not rival redfree light, for the latter makes changes in the superficial retinal layer visible, while the former reveals information as to the deeper layers. With yellow light one can easily distinguish a retinal tear from hemorrhage, for the tear appears gray and the hemorrhage black. Its further advantages are that the pupil does not contract, the patient is not dazzled, the retinal reflex is eliminated, and a beginning macular star is recognizable at its earliest state. R. Grunfeld.

Lijo Pavia, J. **Clinical atlas of ophthalmoscopic photography.** Rev. Oto-Neuro-Oft., 1939, v. 14, Sept., p. 213.

A brief critique of the recently published fundus atlas of Tillé and Couadan.

McAlester, A. W., 3d. **Fluorescent lighting in the taking of central fields.** Amer. Jour. Ophth., 1940, v. 23, Nov., pp. 1265-1266.

Magitot, A., and Dubois-Poulsen, A., **The utility of angioscotometry in diagnosis of the edemas of the papilla.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 32.

The practice of angioscotometry has taught us that the blind spot of Mariotte is far from being a scotoma of fixed dimensions. It reacts to different physiologic factors by contraction or dilatation and indeed seems to be perpetually changing. This fact was known to oculists using the classic instruments of perimetry but angioscotometry has strengthened the evidence. Unfortunately, the aspect of the angioscotoma during the course of papillary stasis presents no precise character except its dimensions, and only ophthalmoscopic examination can confirm the diagnosis. One should therefore make use of an-

gioscotometry only to discriminate a normal from a pathologic appearance and to follow the evolution of a process. It may be very useful in the study of difficult cases, requiring fine discrimination. It has been demonstrated by Sinclair, Van der Hoeve, and others that a narrow zone of amblyopia surrounds the blind spot, its width varying from one eighth to 1 degree according to the size of the index employed. Evans attributes this zone to the presence of vascular shadows surrounding the blind spot in bows and festoons. The authors doubt if this hypothesis is justified. Jerome B. Thomas.

O'Day, Kevin. **The microtomy of the eye.** Med. Jour. Australia, 1940, v. 2, Oct. 12, pp. 336-338.

The technique of celloidin embedding as used in ocular pathology is described in detail. T. E. Sanders.

Walsh, F. B., and Ford, F. R. **Central scotomas; their importance in topical diagnosis.** Arch. of Ophth., 1940, v. 24, Sept., pp. 500-534.

This study is principally based on clinical cases illustrating the occurrence of central defects in visual fields occasioned by lesions at various levels in the optic pathways, the macula, nerve, chiasm, tracts, and radiations. The anatomy of these structures is reviewed in relation to the type of central defect in each. Central scotomas are also considered from a diagnostic standpoint and an outline is presented of the more common etiologic factors. Fifteen illustrative cases are reported and discussed under the etiologic classifications of inflammations, mechanical factors, demyelinating diseases, poisons and toxins, vitamin deficiencies, and hereditary degenerations. (Discussion.) J. Hewitt Judd.

2

THERAPEUTICS AND OPERATIONS

Benstein, I. I. **The effect of diathermy on the eye.** Viestnik Opht., 1940, v. 16, pt. 5, p. 337.

The effect of diathermy on the eye is vasodilatation and increased lymphatic circulation, such as follows the conjunctival injection of dionin and salt solutions. As objective evidence of lymphodilatation there is an increase in the size of the blind spot, which reaches its maximum in thirty minutes following the application of diathermy. The studies were made on normal eyes with normal visual acuity. No constant effect of diathermy on the intraocular tension could be demonstrated. (Illustrations.) Ray K. Daily.

Bristow, J. H. **Temporary myopia due to sulphanilamide.** Arch. of Ophth., 1940, v. 24, Oct., pp. 799-800.

One month after the administration of sulphanilamide for cystitis, a patient was given azosulphamide. The following morning the symptoms of nausea and dizziness developed with an extreme lassitude and marked blurring of distant vision, which was found to be caused by a myopia. This myopia was apparently the result of a swelling or edema of the lens. Normal vision was recovered and there was no residual defect. J. Hewitt Judd.

Bürk, E. **Ultrashort-wave therapy in ophthalmology.** Ophthalmologica, 1940, v. 100, nos. 1 and 2, June-July, p. 43.

The author describes in detail his experience with 144 eye patients treated with ultrashort-wave therapy for a variety of lesions of the ocular adnexa, cornea, sclera, uvea, vitreous, and optic nerve. The list also includes eye injuries and postoperative hemorrhage.

The results were not very encouraging. Only in active suppurative inflammations of the adnexa was the healing time shortened when ultrashort-wave was combined with the usual therapy. Affections of the globe were seldom improved. In general, Bürk believes that this form of therapy is but little, if at all, superior to the usual treatment with heat. F. Herbert Haessler.

Csapody, István de. **Unusual operative problems.** Szemészet, 1940, v. 3, June, p. 3.

Csapody describes five operations which required special research and ingenuity: (1) A cornea became ruptured throughout its whole diameter. By reason of the tonic action of the oblique muscles, the wound gaped in abduction, but closed in adduction. The wound was covered with a conjunctival flap while the eye was in adduction, and the patient was instructed to keep her eye adducted until the wound healed. (2) Because partially healthy corneal tissue and a remnant of anterior chamber existed only near the limbus a corneal transplant was placed eccentrically in a man blind for 47 years. (3) Chronic uveitis had caused pupillary seclusion in each eye by adhesions with dislocated cataractous lenses. The author did not dare to separate the adhesions before extraction for fear that the lenses might fall into the vitreous. By carefully pulling the capsule he was able to separate it from the adhesions and to extract the lens without tumbling. (4) Incarcerated iris pillars and lens capsule caused secondary glaucoma in an aphakic eye. By anterior sclerotomy the author divided the tissue that was blocking the angle of the anterior chamber. Good vision and a lasting decrease of tension resulted. (5) A thick secondary membrane adherent to the iris pillars was extracted by careful pulling after it had been separated with a Graefe knife from its adhesions to the iris pillars.

R. Grunfeld.

Dethmers, P., and Boshoff, P. H. **Grenz rays and their application in ophthalmology. 1. Their properties of penetration.** Arch. of Ophth., 1940, v. 24, Oct., pp. 656-669.

The authors summarize the main features and biologic effect of the so-called "Grenz" ("Grenz" equals "boundary" or "border") rays in general and describe their method of investigating the degree of absorption in the various tissues of the eye. An analysis of the results is presented for pig eyes, and compared with those for two human eyes. The values for human eyes and pig eyes correspond fairly closely. It was found that about 90.25 percent of the rays were absorbed in the cornea, 77.5 percent in the perilimbic part of the sclera, and 78.5 percent in the equatorial part of the sclera. The small percentage of such rays which pass through the cornea are totally absorbed in the aqueous and do not reach the lens. Absorption in the lens with its capsule is 100 percent. Absorption is the factor which largely determines the damaging effect which these rays may have on the delicate and important parts of the eye. The ciliary body may be reached by the rays, but it is doubtful whether the quantity would be sufficient to cause any damage, even if large doses were used. Since corneas without any epithelium show a higher absorption value, the rays may be used for corneal ulcers, keratitis, and corneal abrasions without danger. J. Hewitt Judd.

Evans, J. N. **Arrangement of instruments for ophthalmic operations.**

Amer. Jour. Ophth., 1940, v. 23, Nov., pp. 1262-1265.

Focosi, Marcello. **The action of papaverine as a collyrium.** Boll. d'Ocul., 1939, v. 18, Nov., pp. 837-854.

A 2-percent solution of papaverine was instilled in the conjunctival sacs of 21 patients (11 males), their ages ranging from seven to 35 years. In addition to causing slight irritation of the conjunctiva and slight disturbance of the corneal epithelium, the drug showed a special antispasmodic action on the dilator and constrictor of the pupil if these muscles were in a state of spasm, but no action in normal tonus. It also had an antispasmodic action on the ciliary muscle in a case of spasm of accommodation, but no action in normal accommodation. The writer notes the importance of the drug in relieving spasm without provoking paralysis of accommodation. (Bibliography.)

M. Lombardo.

Genet, L. **Vitamin A and epithelization of the ciliary border.** Bull. Soc. d'Opht. de Paris, 1939, Feb., p. 157.

The author recommends the use of vitamin-A ointment to favor epithelization after X-ray treatment in the region of the eye. Jerome B. Thomas.

Kolen, A. A. **The significance of the conjunctival flap at the limbus in surgical procedures requiring opening of the eyeball.** Viestnik Opht., 1940, v. 16, pt. 5, p. 342.

On the basis of clinical experience the author maintains that the conjunctiva at the limbus exerts a pull which produces gaping of the wound in such procedures as removal of secondary cataract or complicated iridectomy, with consequent loss of vitreous. He therefore recommends preparation of a conjunctival flap and its reflection over the cornea before opening the anterior chamber. Ray K. Daily.

Kolenko, A. B. **Desensitization with adrenalin.** Viestnik Opht., 1940, v. 16, pt. 5, p. 363.

A laboratory study on rabbits, with the conclusions visualizing the possibility of using adrenalin as a nonspecific desensitizing agent. The animals were sensitized to horse serum and desensitized with repeated adrenalin injections. The subsequent immunity lasted about a month. Ray K. Daily.

Magitot, A. **The choline bodies as pressure-lowering collyria.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 38.

The choline bodies most in use as hypotensors are mecholyl, doryl, and iricholine. Six cases are reported in which doryl alone was used, and four more cases in which doryl or iricholine was alternated with pilocarpine. The author concludes that doryl and iricholine are of the same order of efficiency as pilocarpine in the treatment of the hypertension of glaucoma, and are inferior to eserine. They do possess the advantage of reënforcing pilocarpine when mixed with it. The cholines are well tolerated, but are decidedly more expensive than the older collyria. Jerome B. Thomas.

Muncy, W. M. **The relationship of tryparsamide reaction to vitamin deficiency.** Trans. Amer. Acad. Ophth. and Otolaryng., 1939, 44th mtg., p. 134.

The author has treated fifty cases of neurosyphilis with vitamin B and vitamin-B complex. During fever therapy and throughout the series of tryparsamide treatments only one reaction among fifty cases was noted. The author concludes that vitamin-B therapy

renders the use of tryparsamide safe and neurosyphilis may well be placed in the category of preventable diseases. (4 case reports, discussion.)

George H. Stine.

Raab, C. M. **The treatment of eye tuberculosis with a new dye preparation.** Ophthalmologica, 1940, v. 100, nos. 1 and 2, June-July, p. 1.

Thirty patients with various forms of ocular tuberculosis (iridocyclitis, episcleritis, retinal periphlebitis, chorioretinitis) were treated with rubrophen (trimethoxy-dioxy-oxotritane). Rubrophen was effective in about one half of the patients with iridocyclitis, most cases of chorioretinitis, and in all cases of episcleritis and keratoconjunctivitis. It was most effective where there was probability that great sensitivity to tuberculotoxin existed. Treatment lasts from four weeks to several months, and subthreshold doses are aimed at. In one third of his patients, Raab noted mild focal reactions, and in one case a severe reaction which delayed healing of a choroiditis. F. Herbert Haessler.

Ruedemann, A. D., and Zeiter, W. J. **Diathermy in ophthalmology.** Arch. Physical Therapy, 1940, v. 21, Aug., p. 451.

The authors report on the use of deep diathermy heat in sixty patients for 19 different ocular conditions, including central venous thrombosis, corneal lesions, episcleritis, tarsitis, choroiditis, traumatic uveitis, iridocyclitis, retinal detachment, ocular tuberculosis, orbital inflammation, optic atrophy, acute inflammatory glaucoma, and simple glaucoma. This treatment lessens the intensity of pain in acute inflammatory glaucoma, and is also of value in cases of ocular and orbital inflammation, especially in the acute stage. It has also proved effective for deep corneal ulcers and in the early cases of central venous thrombosis. Apparently no benefit is obtained in retinal detachment, ocular tuberculosis, or simple glaucoma. Treatments were given in the form of electromagnetic induction, the wave length of the apparatus being 24 meters. An initial treatment of 15 minutes is employed to determine the patient's tolerance and reaction. If this is well tolerated the time of the succeeding applications is increased to 20 minutes.

Ralph W. Danielson.

Sachs, E., and Heath, P. **The pharmacological behavior of the intraocular muscles. 1. The problem of sensitization, and methods for its study.** Amer. Jour. Ophth., 1940, v. 23, Nov., pp. 1199-1209.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Adrogué, Esteban. **Consideration on the optic agnosias.** Arch. de Oft. de Buenos Aires, 1939, v. 14, Aug., p. 668.

A thorough review of the subject, under the following headings: complimentary anatomical data, limits of cortical blindness, general considerations regarding optic perceptions, psychic blindness, agnosias of the optico-spatial type. (Bibliography.)

Plinio Montalván.

Allen, F., and Schwartz, M. **The effect of stimulation of the senses of vision, hearing, taste, and smell upon the sensibility of the organs of vision.** Jour. Gen. Physiology, 1940, v. 24, Sept. 20, pp. 105-121.

The authors found that stimulation with red light, sound, quinine, and odors produced, by immediate action,

much the same effect on vision (depression of the red sensation and enhancement of the green), the magnitude in all cases being the same. They believe that the results of their experiments afford a confirmation of Young's tricomponent theory of color vision. In stimulation of the ear, it was found that loud and weak tones of the same low pitch evoked opposite conditions of responsiveness in the eye. It was also shown that stimulation of the left ear evoked an enhanced visual response in the right eye. The authors conclude that stimulation of any sense organ influences all other sense organs in their excitability and that many such phenomena must originate in fluctuations of responsiveness of the central organs, as well as in the receptors.

T. E. Sanders.

Berens, C. **Large square prisms of thermoplastic material.** Trans. Sec. on Ophth., Amer. Med. Assoc., 1939, 90th mtg., p. 474.

To obviate breakage the author has devised a set of square prisms made of thermoplastic material. The new prisms are lighter than ordinary glass and are practically indestructible.

George H. Stine.

Berens, C. **Modified Perlia test for depth perception at middle distance.** Trans. Sec. on Ophth., Amer. Med. Assoc., 1939, 90th mtg., p. 469.

The Perlia test as to judgment of the relative position of objects at middle distance has been modified by placing 12-mm. and 20-mm. white balls at the ends of two rods a yard in length. With one rod and ball the subject attempts to strike the ball at the end of the rod in the examiner's hand. The apparatus is inexpensive. Its use at middle distance obviates the difficulties arising from muscular imbalance at the near point. (2 figures.)

George H. Stine.

Berens, C. **Visual-acuity test, applicable to testing large groups of subjects.** Trans. Sec. on Ophth., Amer. Med. Assoc., 1939, 90th mtg., p. 472.

Berens describes a simple acuity test for examining large groups of subjects of all ages. (One figure.)

George H. Stine.

Broda, E. E., Goodeve, C. F., and Lythgoe, R. J. **The weight of the chromophore carrier in the visual-purple molecule.** Jour. of Physiology, 1940, v. 98, Sept. 14, p. 397.

Visual purple is now generally considered to be a protein, belonging to the class known as chromoproteins. In a chromoprotein the chromophore is commonly the reactive part while the bulky protein seems to act mainly as a support. The carrier weight of a chromoprotein is defined as the molecular weight of a chromoprotein containing one chromophore. Visual purple occupies from 5 to 10 percent of the volume of the rods in the retina.

Edna M. Reynolds.

Fletcher, D. E. **The influence of color and form vision on the progress of medical students in microscopic anatomy: implications in medical education.** Jour. Assoc. Amer. Med. Colleges, 1940, v. 15, Sept., pp. 301-316.

Color-vision tests were given to 432 medical students who were rated qualitatively as regards degrees of color and color-form sensitivity into four classes for comparative study. The author concludes that color-form perception is a very important factor in the progress of students in microscopic anatomy but bears little positive relationship to the actual grades made in the work. It is

suggested that the color test of applicants for entrance into medical schools be made a routine practice.

T. E. Sanders.

Friedman, Benjamin. **The Jackson crossed cylinder. A critique.** Arch. of Ophth., 1940, v. 24, Sept., pp. 490-499.

The use of the cross cylinder is discussed as a means of building up the spherocylindric combination, of determining the strength and axis of the cylinder, and of estimating the presbyopic correction. The author believes that its greatest value lies in the determination of the astigmatic axis. A so-called simplified test for axis based on the optical principles of the cross cylinder is offered. J. Hewitt Judd.

Guyton, J. S. **Pharmacodynamics of the intraocular muscles.** Arch. of Ophth., 1940, v. 24, Sept., pp. 555-580.

This article consists of a summary of the concepts of chemical mediation as related to the actions of various groups of drugs on the autonomic nervous system as a whole, a review of the actions of the individual intraocular muscles, and a summary of the effects of the more commonly used individual drugs having a peripheral action on the pupil and on accommodation when instilled into the conjunctival sac.

J. Hewitt Judd.

Hartinger, H. **Optical delusions caused by defective vision.** Klin. M. f. Augenh., 1940, v. 105, July, p. 89.

A mathematical discussion of certain astigmatic distortions of the lines in a test object. C. Zimmermann.

Hay, J. C., and Roaf, H. E. **The blue-green region of the spectrum.** Jour. of Physiology, 1940, v. 98, Sept. 14, p. 389.

The position and extent of the blue-green region of the spectrum was determined in one hundred subjects. Defective color vision does not affect the width or position of the blue-green region nor does light or dark adaptation. The yellow region of the spectrum is more uniformly discriminated than the blue-green region.

Edna M. Reynolds.

Herren, R. Y. **The visuopsychic apparatus and the accommodation reflex.** Arch. Neurology and Psychiatry, 1940, v. 43, June, p. 1185.

This case report illustrates an infrequently encountered physiologic phenomenon. Theodore M. Shapira.

Herzau, Werner. **Aniseikonia.** Klin. M. f. Augenh., 1940, v. 105, July, p. 94.

The author hopes that the possibility for exact testing and correction of aniseikonia may also be developed in Germany. C. Zimmermann.

Jacovlev, S. T. **The effect of adrenalin on Rayleigh's interval.** Viestnik Opht., 1940, v. 16, pt. 5, p. 361.

Sixteen persons were tested with the Nagel anomaloscope. The data confirm Kravkov's findings that conjunctival instillation of adrenalin increases the sensitivity for green and lowers it for red. Ray K. Daily.

Lindner, K. **Reply to Weber's criticism regarding origin of myopia.** Klin. M. f. Augenh., 1940, v. 105, July, p. 113.

(See under Weber, Ernst.)

Maude, John. **Optical convergence and stereopsis in relation to perspective.** Med. Jour. Australia, 1940, v. 2, Sept. 28, p. 281.

The evolution of stereoscopic vision is discussed as well as the grades of binocular vision. In one hundred art

students of various ages, a relationship was shown to exist between voluntary convergence and artistic merit. The majority of those having superior artistic ability had a fair degree of voluntary convergence while the majority of those having mediocre artistic skill had poor or no voluntary convergence.

Edna M. Reynolds.

Pascal, J. I. **Bifocal lenses.** Arch. of Ophth., 1940, v. 24, Sept., pp. 553-554.

The author points out that a monocentric rather than a bicentric is the ideal bifocal lens. The difficulty patients have with modern bifocal lenses is probably largely due to the lenses having separate optical centers. The two separated optical centers cause an image to be formed along two axes, and if both sets of light pencils enter the pupil, the object is seen double.

J. Hewitt Judd.

Pascal, J. I. **Fundamental differences between crossed-cylinder and line-chart astigmatic tests.** Arch. of Ophth., 1940, v. 24, Oct., pp. 722-730.

Tests with line charts and the cross cylinder for determination of correctable astigmatism, its axis and amount, are compared and the basic differences between the various tests explained. Since there is no one test which will always work, a knowledge of the conditions under which each test is most reliable will enable one to utilize them all more effectively. J. Hewitt Judd.

Verrier, L. **Comparative histophysiology of the fovea of vertebrates.** Bull. Soc. d'Opht. de Paris, 1939, Feb., p. 99. (See Section 19, Anatomy, embryology, and comparative ophthalmology.)

Viallefont, H. **Antiglare spectacles for night-driving of automobiles.** Bull. Soc. d'Opht. de Paris, 1939, Feb., p. 97.

The glasses are composed of flat, plano lenses to each of which a very dark paster is attached at its upper left quadrant. When passing oncoming lights the driver inclines his head slightly downward and to the right.

Jerome B. Thomas.

Weber, Ernst. **The scientific impossibility of Lindner's myopia theory.** Klin. M. f. Augenh., 1940, v. 105, July, p. 111.

Criticism of Lindner's theory.

4

OCULAR MOVEMENTS

Bartels, M. **Congenital malformations: strands at the site of the superior rectus, absent inferior rectus, microcornea, and coloboma of the iris. Operative method for correction of upward displacement of the eyeball.** Klin. M. f. Augenh., 1940, v. 104, June, p. 727.

At the region of the insertion of the superior rectus the conjunctiva was incised horizontally and the more posterior strand excised. The conjunctival incision was then sutured vertically. The conjunctiva at the insertion of the lower rectus was horizontally incised and from the lower limbus a suture including the episclera was carried through the lower fornix and skin, pulled down, and fastened onto a piece of rubber. Vertical motility was partially recovered after removal of the strand, apparently because of the action of the inferior oblique.

C. Zimmermann.

Burri, Clara. **Results achieved by orthoptic training in the correction of strabismus.** Arch. of Ophth., 1940, v. 24, Oct., pp. 784-791.

This study is based on the results obtained in 256 cases treated in the or-

thoptic clinic at Northwestern University medical school. The patients are grouped into two divisions for comparative study. The first group consists of 174 patients treated between 1933 and 1937, and the second group of 82 patients who were treated during the past two years. The results are discussed and tabulated. It was found that 25 percent of the patients treated in the past two years recovered with orthoptic training alone, although only weekly exercises were given; and another 25 percent improved more or less, depending on the degree and complexity of the squint and the duration of the total time during which they received training. Accommodative strabismus gave the best prognosis for complete recovery from orthoptic exercises alone. Orthoptic training should not be regarded as a cure-all, but rather as an aid to operation, both before operation and for correcting any remaining deviation or defect in fusion and stereopsis after operation has been done. The amount of improvement in visual acuity was variable and depended partly on the length and regularity of occlusion and partly on the age of the patient.

J. Hewitt Judd.

Good, Palmer. **Clinical use of lacquer in ophthalmology; for the treatment of squint suppression, amblyopia, and diplopia.** Arch. of Ophth., 1940, v. 24, Sept., pp. 479-481.

For obscuring vision, the use of lacquer on the ophthalmic lens presents certain advantages over atropine or the patch. The degree of obscuration may be varied by the amount of brushing or stippling the lacquer receives as it dries. For patients with diplopia in one direction only, that portion of the lens used in this area may be lacquered. The vision in the two eyes can be equalized and binocular vision stimulated rather than suppressed. The field of vision is unimpaired, and there is no objectionable appearance. J. Hewitt Judd.

Harms, H. **A method of advancement with the possibility of later correction.** Klin. M. f. Augenh., 1940, v. 104, June, p. 729.

Beside the regular sutures which fasten the muscle at its new attachment, other sutures are placed through sclera, muscle, and conjunctiva. These allow a further drawing forward of the muscle in the first few days after operation if necessary. C. Zimmermann.

Jaensch, P. A. **Atypical torticollis ocularis from a missing inferior rectus.** Klin. M. f. Augenh., 1940, v. 104, June, p. 733.

In a boy of 13 years with forced inclination of the head toward the right shoulder, complete absence of the right inferior rectus with overaction of the right superior rectus was demonstrated. The condition was complicated by dissociated vertical movements (alternating sursumvergent strabismus), probably a congenital malformation. By tenotomy of the superior rectus, advancement of the fascia of the inferior rectus, and cutting a tough strand, the inclination of the head was overcome.

C. Zimmermann.

Posner, I., and Piatt, A. D. **Ocular hypertelorism with cleft palate and giant-cell tumor.** Radiology, 1940, v. 35, July, p. 79. (See Section 13, Eyeball and orbit.)

5

CONJUNCTIVA

Ageloff, Harry. **Erythema multiforme bullosum with involvement of the mucous membranes of the eyes and**

mouth (Stevens-Johnson disease). New England Jour. Med., 1940, v. 223, Aug. 8, p. 217.

On admission to the hospital, the patient was unable to open her eyes because of a thick purulent exudate along the lids. After two days of treatment with frequent boric-acid eye washes and instillation of a 1-to-2500 solution of metaphen the eyelids could be opened and the corneae were found to be intact. Seven days after admission, the conjunctival discharge was noticeably decreased. Later, a cicatricial ectropion developed due to scab formation under both lower lids. After softening and removal of the scabs there was almost complete restoration of the eyelids to normal. By the twenty-first day, the eye condition was considered normal.

The essential features of the case were lack of involvement of the scalp by the skin lesions; involvement of the mucous membranes of the eyes, mouth, and vagina, the acute course lasting less than three weeks; and the absence of scar formation after healing.

Edna M. Reynolds.

Bonnet, P., and Bonamour, G. **Nevocarcinomas of the semilunar fold.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 81.

Report of two cases of nevocarcinoma with histologic preparations, both cases discovered in patients seeking relief for other ocular troubles. The authors find the slitlamp useful in determining the nature of these tumors, by revealing the character of vascularization. They strongly oppose control biopsy in these tumors as well as in tumors of the caruncle, because of the greater risk of dissemination. But they advise their complete removal even though malignancy may be in doubt.

Jerome B. Thomas.

Braley, Alson. **Intracellular bodies of the conjunctival epithelial cells.** Arch. of Ophth., 1940, v. 24, Oct., pp. 681-690.

The author outlines his procedure in the taking, staining, and examining of epithelial scrapings for diagnostic purposes. Examination of stained preparations of conjunctival epithelial scrapings reveals the inclusion bodies of trachoma and inclusion conjunctivitis as discrete blue or purple bodies. Intracellular bodies consisting of mitochondria, pigment, keratin, mucin from goblet cells, nuclear extrusions, phagocytosed cellular debris, and extracellular bacteria are described and illustrated with photomicrographs. (Discussion.)

J. Hewitt Judd.

Cooper, W. L. **Management of recurrent trachoma following sulphanilamide therapy.** Arch. of Ophth., 1940, v. 24, Sept., pp. 467-472.

In 21 of 34 patients with trachoma treated with sulphanilamide, a recurrence was encountered within from six to thirty months. Sixteen of these patients were subsequently treated with iontophoresis and none had a second recurrence, the majority having been followed for over two years. The treatment suggested consists of at least eight applications of quinine bisulphate by iontophoresis following apparent cure by sulphanilamide. Some points in technique and the adjuvant use of vitaman A are also considered.

J. Hewitt Judd.

Folk, M. R. **Boeck's sarcoid of the palpebral conjunctiva.** Arch. of Ophth., 1940, v. 24, Sept., pp. 462-466.

A man aged 49 years complained of a gradual development of redness in the right eye for six months. The margins of the lids were red and thickened and the palpebral conjunctiva was beefy-

red and hyperplastic, with rounded outgrowths of granulation tissue arising from the palpebral fornices. The bulbar conjunctiva was moderately injected and symblepharon was present on both sides of the cornea. The diagnosis was determined after microscopic examination of a biopsy specimen. The author briefly reviews the literature and discusses the etiology, prognosis, differential diagnosis, and treatment of this rare condition. (Photomicrograph.)

J. Hewitt Judd.

Genet. L. **Syndrome of the nasal ganglion or partial zona ophthalmica?** Bull. Soc. d'Opht. de Paris, 1939, Feb., p. 159.

A woman 42 years old presented a slight edema of the border of the upper lid, and hyperemia involving the entire bulbar conjunctiva.

Jerome B. Thomas.

Howard, P. J. **Phlyctenular conjunctivitis.** Jour. of Pediatrics, 1940, v. 17, Aug., pp. 185-192.

Details of tuberculin treatment of 16 cases of phlyctenular conjunctivitis in children are given. In addition, atropine was used locally and an adequate diet secured. The author concludes that in most cases the acute inflammation can be overcome in from three to six weeks. He believes that it is important to determine the smallest amount of tuberculin to which the patient will give an intradermal reaction, and to start desensitizing injections below this point. If either local or general reactions are encountered the amount of tuberculin must be reduced. T. E. Sanders.

Jancke, G. **Experiments on animals as a contribution to the etiology of epidemic keratoconjunctivitis (keratoconjunctivitis epidemica nummularis).** Klin. M. f. Augenh., 1940, v. 105, July, p. 7. (See Section 6, Cornea and sclera.)

Lachman, G. S. **Fibrosis of the caruncle simulating a new growth.** Trans. Pacific Coast Oto-Ophth. Soc., 1939, 27th mtg., pp. 208-213.

In a 19-year-old woman the left caruncle had been considerably larger than the right for several years, but had recently started to increase rapidly in size. The mass was firmly attached to the sclera and after removal measured 7 by 5 by 3 mm. Histologically it was found to be a benign fibrosis of the caruncle and no recurrence was noted in the following three years.

Lawrence G. Dunlap.

Lugossy, Julius. **Chemotherapy in paratrachoma.** Ophthalmologica, 1940, v. 100, nos. 1 and 2, June-July, p. 68.

The author uses deseptyl, a sulphamide derivative, in the ocular inclusion-body affections of genital origin and thinks it is of great value. Although the healing time is not materially shortened, the acute distressing phenomena, such as swelling of the lids, photophobia, lacrimation, and discharge, disappear rapidly. The author presumes that the drug reduces the resistance of the virus so that the defense mechanism of the host is not impeded.

F. Herbert Haessler.

Meesmann, A., and Bachmann, W. **Clinical observations and microbiologic findings in epidemic keratoconjunctivitis.** Klin. M. f. Augenh., 1940, v. 105, July, p. 1. (See Section 6, Cornea and sclera.)

Oláh, Emil. **Encanthis trachomatosa.** Arch. of Ophth., 1940, v. 24, Oct., pp. 772-783.

Several cases are reported showing

that a trachomatous inflammation does involve the caruncle. Pathologic studies of the excised specimens confirmed the clinical findings. Transconjunctival expression led to healing, and is recommended as producing the best results in these cases. The author describes his method of expression, for which a special instrument has been devised. (Photomicrographs.)

J. Hewitt Judd.

Oláh, Emil. **Lines on the bulbus beneath the conjunctiva.** Arch. of Ophth., 1940, v. 24, Oct., pp. 792-795.

If the upper lid is pushed upward and backward with a suitable instrument while the patient looks downward, in some instances easily distinguishable lines can be seen macroscopically under the conjunctiva. These can be observed only in the bulbar conjunctiva above the cornea and repeated examination always shows the lines in the same formation. The lines do not extend through the entire thickness of the conjunctiva, but are located under the deep conjunctival vessels. Their true nature is not known.

J. Hewitt Judd.

Scheerer, R. **The question of keratoconjunctivitis epidemica.** Klin. M. f. Augenh., 1940, v. 105, July p. 110. (See Section 6, Cornea and sclera.)

Wells, D. M. **An apparatus for the manufacture of wax-paraffin ampoules for silver-nitrate solution used in the prevention of ophthalmia neonatorum.** Jour. Lab. and Clin. Med., 1940, v. 25, July, p. 1096.

Wax ampoules are prepared according to the method of Bunney by first dipping brass spindles into melted paraffin twice and then dipping the spindles several times into a melted mixture of paraffin and beeswax. The ampoules are then filled with silver-nitrate solution and sealed by running melted paraffin on top of this solution. The author describes an equipment consisting of three melting tanks, two dipping vats, and two overflow pans, each of which has a separate heating unit. Diagrams for the construction of the apparatus are shown.

John C. Long.

6

CORNEA AND SCLERA

Adamantiadis, B., and Djacos, C. **A family with granular dystrophy of the Groenouw type.** Ophthalmologica, 1940, v. 100, nos. 1 and 2, June-July, p. 3.

The authors were able to study a family in whom the granular type of corneal dystrophy occurred. Heredity was dominant. F. Herbert Haessler.

Bietti, Giambattista. **The so-called "Coats's white rings" of the cornea.** Boll. d'Ocul., 1939, v. 18, Dec., pp. 907-922.

Four patients (one a woman) whose ages ranged from 39 to 56 years, each showed in one cornea small whitish-gray spots forming a circle 0.5 to 1.5 mm. in diameter. Three of the patients presented symptoms of recent or old iridocyclitis and one gave the history of a slight eye trauma. Bowman's membrane appeared to be thinned or absent at the level of these rings. Behind Bowman's, new-formed cellular elements were seen, and also amorphous tissue of hyaline aspect. The article concludes with a discussion of the etiology and pathogenesis of these rings. (Bibliography, 11 figures.) M. Lombardo.

Chisholm, J. F., Jr. **Corneal molding for contact glasses.** Arch. of Ophth., 1940, v. 24, Sept., pp. 552-553.

The fixation target consists of a heavy black circle containing a large black dot. The card is held by a carrier which may be adjusted to various heights. After the mold is made, much of the discomfort in removing it can be obviated by having the patient rotate his eye upward as far as possible, applying a muscle hook to the sclera at the lower edge of the mold, and then with steady pressure dimpling the globe to allow air to enter between the mold and the globe.

J. Hewitt Judd.

Green, A. S., and Green, M. I. **A simplified operation for keratoplasty.** Arch. of Ophth., 1940, v. 24, Sept., pp. 544-546.

The authors' technique is a modification of the Filatov keratoplasty, using an automatic trephine with a 4 or 4.5-mm. blade, guarded with a shoulder extending 1 to 1.5 mm. from the cutting edge for both donor and recipient eyes. A conjunctival flap is first prepared by making a horizontal incision about 12 mm. long in the upper fornix and dissecting the conjunctiva down to the limbus. Three black silk sutures are introduced into the distal end of the flap. After the graft is in place the prepared conjunctiva is turned down over the entire cornea, with the unbroken epithelium of the conjunctiva in contact with the transplanted cornea; and is pulled down carefully and sutured in place to the conjunctiva at the limbus below. If the eye is not investigated for one week the flap will hold the graft in place securely enough without corneal sutures being used. The technique of the operation is illustrated with drawings.

J. Hewitt Judd.

Jancke, G. **Experiments on animals as a contribution to the etiology of epidemic keratoconjunctivitis (keratoconjunctivitis epidemica nummularis).** Klin. M. f. Augenh., 1940, v. 105, July, p. 7.

All descriptions emphasize a violent conjunctivitis with numerous coin-shaped opacities of the cornea similar to those of keratitis nummularis (Dimmer). Investigations of etiologic agent and infectiousness were made on rabbits and guinea pigs. It was found that transmission from conjunctiva to conjunctiva of animals was not as virulent as in man. Probably the condition is caused by an ultramicroscopic virus related or similar to herpes virus. A slight lesion of the epithelium favors the onset of the disease.

C. Zimmermann.

Jung, J. **Keratoconus and injury.** Klin. M. f. Augenh., 1940, v. 105, July, p. 26.

Lime entered the left eye of a man of 27 years without causing an erosion. About two months later irregular astigmatism developed and the cornea appeared conical. Probably this latter condition had existed before the injury, but had been overlooked.

C. Zimmermann.

Kopp, I. F. **Five years of clinical observation on partial corneal transplantation.** Viestnik Opht., 1940, v. 16, pt. 5, p. 305.

An analysis of 62 transplantations on 45 patients. The data show 50.09 percent of transparent and 13.5 percent semitransparent transplants in grafts from freshly enucleated eyes. In grafts from cadaver eyes 52.94 percent were transparent and 18.65 percent semitransparent. The postoperative reaction was milder in cases with cadaver transplants. Glaucoma was the main cause

of most opaque transplants. When not present before the operation, glaucoma may be produced by postoperative synechia. Ray K. Daily.

Meesmann, A., and Bachmann, W. **Clinical observations and microbiologic findings in epidemic keratoconjunctivitis.** Klin. M. f. Augenh., 1940, v. 105, July, p. 1.

From the beginning of August, 1939, to the end of February, 1940, about 250 cases of epidemic keratoconjunctivitis were observed at the eye clinic of Kiel, almost half of them originating from a single focus of infection in an industrial district. In contrast to other conjunctival inflammations the caruncle was swollen and red with glossy swelling of the semilunar plica, photophobia, lacrimation, and marked ptosis as early as the third or fourth day. The conjunctiva was diffusely inflamed with numerous follicles in the upper and lower fornices, and the preauricular glands were swollen. The follicles soon disappeared and were not visible by the second or third week. In about 15 percent of the cases lesions of the epithelium occurred around the center of the cornea. These later extended into the deeper layer, lasting from four to five months, and showing slight indentations of the corneal surface apparently resulting from absorption of necrotic material from Bowman's membrane and lamellae close to the surface. This caused an irregular astigmatism with impaired vision. The incubation period was about eight days and there was no immunity against relapse. Cultures showed slowly-growing diphtheroid organisms (xerosis bacilli) in symbiosis with staphylococci. As antidiphtheric serum diluted with salt solution, instilled every two or three hours at the beginning, checked the disease in a few days, this treatment is recommended in every case. C. Zimmermann.

Meyer, K., and Chaffee, E. **The mucopolysaccharide acid of the cornea and its enzymatic hydrolysis.** Amer. Jour. Ophth., 1940, v. 23, Dec., pp. 1320-1324.

Pacalin, G. **Treatment of hypopyon keratitis by thermopuncture of the cornea.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 42.

The author believes he was the first to replace the Saemisch operation by galvanocautery puncture of the cornea, which for seven years he has continued to practice with success. At first he limited the treatment to corneal ulcers accompanied by hypertension, but experience has caused him to use the operation in cases of corneal ulcer unaccompanied by pain or hypertension. He attributes the good results in the latter type of cases, which may develop slowly and may fail to evacuate the hypopyon at the time of puncture, to renewal of the aqueous humor.

Jerome B. Thomas.

Poschin, B. P. **Biomicroscopy of a normal Denig's flap.** Viestnik Opht., 1940, v. 16, pt. 5, p. 333.

A description of the biomicroscopic picture of a mucous-membrane transplant in its various stages shows that vascularization is derived from the deep episcleral and scleral vessels. Its vascular connection with the underlying pannus and overlying conjunctiva is only capillary, and even that develops late. For obliteration of the corneal pannus it is not sufficient to destroy the continuity of the conjunctival vessels; the deep limbal vessals have to be obliterated as well, and to this end the episcleral tissue should be thoroughly curetted. The surgical hemostasis and

subsequent obliteration of the corneal vessels produce changes in the nutritive processes of the infiltrating elements leading to their necrobiosis and absorption. The vascularization process in the transplants is the same, whether the transplant be thick or thin, and the thickness of the transplant is of no significance in the disappearance of the pannus. Ray K. Daily.

Roggenkämper. **Therapy of keratitis nummularis (epidemica).** Klin. M. f. Augenh., 1940, v. 105, July, p. 109.

After five daily instillations of suprarenin solution the follicles disappeared in a few days, and the corneal infiltrations and subepithelial opacities did not progress. C. Zimmermann.

Scheerer, R. **The question of keratoconjunctivitis epidemica.** Klin. M. f. Augenh., 1940, v. 105, July, p. 110.

Early roentgen radiation proved beneficial in the treatment of this disease. C. Zimmermann.

Spector, C. A. **Ocular changes in lupus erythematosus.** Viestnik Opht., 1940, v. 16, pt. 5, p. 367.

Review of the literature and report of a case of corneal involvement in lupus erythematosus. The corneal lesion consisted of a large epithelial defect with sharp and irregular edges, without tendency to vascularization. Ray K. Daily.

Tettamanti, Julio. **Epithelial dystrophy of the cornea.** Arch. de Oft. de Buenos Aires, 1939, v. 14, Sept., p. 657.

After a brief discussion of the subject, a case of epithelial dystrophy of the cornea in the right eye of a 26-year old man is reported. The family history was negative. A year previously this eye was affected with scleritis which had cleared up before the onset of the epithelial dystrophy. The grayish veil-like opacity covered the pupillary area and the lower portion of the cornea, and its boundaries were clearly demarcated. There were no inflammatory signs and the slitlamp revealed normal thickness of the cornea with the lesion limited to the most superficial layers, the stroma and the endothelium being intact. Corneal sensitivity was considerably reduced and vision was 5/10. The opacity gradually increased in size and four months later it covered the entire pupillary area. Vision was further reduced to 1/10 and the corneal epithelium showed edema and the formation of tiny vesicles, without involvement of the stroma. Two years later the opacity had covered the entire cornea except for a narrow strip near the limbus above. All treatments instituted were of no avail. Because of the age of the patient and the unilateral character, the condition could not be classified as Fuchs's epithelial dystrophy, but its clinical characteristics and evolution showed a definite similarity to it. Plinio Montalván.

Wasserman, I. A. **The postoperative course in corneal transplantations.** Viestnik Opht., 1940, v. 16, pt. 6, p. 410.

The complications of this operation are delayed restoration of the anterior chamber, glaucoma, and opacification of the transplant. Delayed restoration of the anterior chamber is frequent in cases of parenchymatous keratitis. Opacification of the transplant may be caused by iritis and iridocyclitis, and glaucoma. In cases with preoperative glaucoma the transplants rapidly became opaque, and conservative and surgical antiglaucomatous measures were ineffective. Glaucoma was a frequent complication in cases of adherent

leucoma; 22 percent of such cases were operated upon for glaucoma within four to six weeks after the transplantation. Thirty percent of the cases of parenchymatous keratitis were operated upon for glaucoma following the transplantation. Vascularization of the transplant may be a part of a postoperative inflammation or may occur as an isolated process. The danger of these postoperative complications calls for careful postoperative care and prompt institution of measures to combat arising complications.

Ray K. Daily.

Weekers, Roger. **Biochemistry of the normal and morbid cornea.** Ophthalmologica, 1940, v. 100, Sept., p. 136.

The author reports his own studies and quotes copiously from the literature, but the positive yield is meager. He states that the chemical composition of the cornea is sufficiently known to form the basis of physiologic research. The reactions which take place in the cornea are relatively slow. Although the permeability of the cornea to oxygen, carbon dioxide, and salts has been extensively studied, results are contradictory because of the extreme difficulty inherent in the method. In the pathologic cornea only the end stages are studied, and the cause and process of development remain obscure.

F. Herbert Haessler.

7

UVEAL TRACT, SYMPATHETIC DISEASE AND AQUEOUS HUMOR

Dalsgaard-Nielsen, Esther. **Uveoparotid fever in a case of Boeck's sarcoid.** Acta Ophth., 1940, v. 18, pt. 2, p. 210.

A comprehensive review of the literature, covering about eighty cases of uveoparotid fever. In the author's case, a man 28 years old developed a bilateral parotitis followed shortly by a bilateral iridocyclitis, with precipitates but without nodules or synechia. The etiologic search was negative. Roentgenography of the lungs showed an enlargement of the hilus shadow on both sides, and a diagnosis of Boeck's sarcoid of the lungs was made. On biopsy the parotid tissue contained closely packed nodules of epithelioid cells with relatively few giant cells and no necrosis. The piece of iris excised in an iridectomy of one eye was negative for Boeck's sarcoid. This case demonstrates the close relation between uveoparotid fever and benign lymphogranulomatosis. (Illustration.)

Ray K. Daily.

Fuchs, A. **When is an eye dangerous as to producing sympathetic ophthalmia? Sympathetic ophthalmia after enucleation of an eye injured six days previously.** Klin. M. f. Augenh., 1940, v. 104, June, p. 680.

To demonstrate that the danger of sympathetic ophthalmia may exist before the end of the second week, and that to wait for inflammatory signs in the second eye is very dangerous, Fuchs reports the following case: A man of 62 years injured his left eye while splitting wood. At the clinic an irregular perforating wound was found at the outer lower side of the limbus with prolapse of the uvea; two thirds of the anterior chamber was filled with blood. As there was no perception of light, after six days the left eye was enucleated. Anatomic examination showed foci of lymphocytes with some epithelioid cells in the choroid. Nineteen months later the patient returned with iridocyclitis of the right eye, evidenced by numerous recent gray pre-

cipitates, opacity of the aqueous, and intense swelling of the iris. The inflammation subsided and after six months the eye was free of any inflammation. It could not be ascertained when the inflammation had begun but Fuchs assumed the interval to be one or two months after enucleation. Every eye with a serious perforating injury ought to be removed at once if vision cannot be preserved or restored. Fuchs warns against evisceration, as a great many cases have been reported in which sympathetic ophthalmia followed this procedure. C. Zimmermann.

Hurtault, J. B., and Sverdlick, J. **Persistent pupillary membrane, ectropion uveae, and atypical coloboma with hypoplasia of the stroma of the iris.** Arch. de Oft. de Buenos Aires, 1939, v. 14, Sept., p. 651.

A nine-year-old girl presented in the left eye a dense pupillary membrane attached to the pupillary border itself and stretching across an atypical coloboma of the iris, oriented toward the temporal side. There was a uveal ectropion confined to the border of the coloboma, the rest of the pupillary border being normal. The peripheral portion of the iris at the level of the coloboma showed a hypoplasia of the stroma, more evident by scleral transillumination. Visual acuity was 0.25 and the fundus was normal. The right eye was entirely normal. The embryologic and pathologic aspects of persistent pupillary membrane and coloboma of the iris are discussed. The interest of the present case lies in the fact that the membrane was inserted in the pupillary margin instead of in the anterior surface of the iris. Family history was negative. The author concludes that the anomaly was not of germinal origin, but probably was due to mechanical or physico-chemical factors acting during the fifth month of fetal life, when the process of atrophy of the pupillary membrane takes place. Plinio Montalván.

Jensen, C. D. F. **Sympathetic ophthalmia following cataract surgery.** Trans. Pacific Coast Oto-Ophth. Soc., 1939, 27th mtg., pp. 238-244.

After reviewing the literature on the incidence of sympathetic ophthalmia following cataract extraction (in approximately 16,000 cataract extractions, 13 cases of sympathetic ophthalmia were reported), Jensen discusses a case of his own in which the patient struck her eye the second day after an uneventful extracapsular cataract extraction. The eye was removed. An uneventful intracapsular cataract extraction was performed a year later on the other eye with resultant vision of 20/40. Lawrence G. Dunlap.

Luo, T. H., and P'an, S. Y. **Concentration of sulphanilamide in the aqueous humor of human eyes, with special reference to local application.** Chinese Med. Jour., 1940, v. 58, Aug., p. 167.

Previous reports of this character have dealt mainly with experiments on animal eyes while here the work was done with humans. Sulphanilamide was taken orally, or instilled in a 1-percent solution, or applied as a thick layer of powder over the cornea. The aqueous was entirely withdrawn after ten minutes and one hour respectively in the first two methods and after one or two hours in the third method. In the first two methods the drug concentrations were found to be about comparable with each other and practically the same for the two specimens. When the powder was used the concentration was considerably higher, reaching 44.4 mg.

per 100 c.c. in one patient after one hour. It is noteworthy that the application of the powder, which was preceded by one drop of pontocaine and followed by keeping the eye closed for one hour, brought about almost no untoward reaction. The authors suggest a further trial of the powder in the therapy of ocular infections.

Morris Kaplan.

McKinney, I. M., and Frocht, M. **Adie's syndrome.** Amer. Jour. Med. Sciences, 1940, v. 199, April, p. 546.

The authors report seven cases of Adie's syndrome and discuss various theories as to the location and nature of the pathology. They state that it runs a chronic and benign course and is nonluetic. Theodore M. Shapira.

Mikhaelian, P. X., Zyck, H. F., and Vigodskaja, I. G. **The effect of irritation of peripheral nerves on the appearance of agglutinins in the anterior chamber of the rabbit.** Viestnik Opht., 1940, v. 16, pt. 5, p. 301.

This laboratory investigation consisted in determining the effect of section of the sciatic nerve on the agglutinin reaction of the blood serum and aqueous in rabbits immunized with typhoid vaccine. While there was a slight rise in the agglutinin content of the blood serum, it was not sufficient for positive conclusions. There was no appreciable difference in the agglutinin content of the aqueous in the experimental and control animals.

Ray K. Daily.

Parker, W. R. **Severe uveitis with associated alopecia, poliosis, vitiligo and deafness.** Arch. of Ophth., 1940, v. 24, Sept., pp. 439-446.

The author reviews the findings in two cases, previously reported, in which there was a severe uveitis characterized clinically by binocular involvement, rapid course, grave prognosis, and association with alopecia, vitiligo, poliosis, and partial deafness. The findings in all the 29 cases now reported in the literature are summarized to show that the marked similarity in the symptoms, together with the lack of benefit derived from treatment, suggests the possibility of a definite clinical entity, independent of syphilis or tuberculosis, the causation of which is unknown and for which no specific treatment is available.

J. Hewitt Judd.

Roepke, R. R., and Hetherington, W. A. **Osmotic relation between aqueous humor and blood plasma.** Amer. Jour. Physiology, 1940, Aug. 1, p. 340.

The osmotic activity of aqueous humor was found normally higher than that of blood plasma. The reinjection of aqueous humor containing bichloride of mercury into the anterior chamber posterior to the iris abolishes this difference in osmotic activity.

Theodore M. Shapira.

Sachs, E., and Heath, P. **The pharmacological behavior of the intraocular muscles. 2. Sensitization phenomena in the dilator and sphincter iridis.** Amer. Jour. Ophth., 1940, v. 23, Dec., pp. 1376-1387.

Swan, K. C., and Hart, W. M. **A comparative study of the effects of mecholyl, doryl, eserine, pilocarpine, atropine, and epinephrine on the blood-aqueous barrier.** Amer. Jour. Ophth., 1940, v. 23, Dec., pp. 1311-1319.

Velhagen. **Reactive new-formation of connective tissue around cholesterin crystals in the vitreous of an**

atrophic globe. Klin. M. f. Augenh., 1940, v. 104, June, p. 752.

A woman of 52 years with high myopia had lost the vision of her right eye 15 years previously from detachment of the retina after she had been repeatedly treated for intraocular hemorrhages and opacities of the vitreous. The somewhat shrunken eyeball became painful and had to be enucleated. It contained numerous cholesterin crystals and giant cells surrounded by collagenous connective tissue.

C. Zimmermann.

8

GLAUCOMA AND OCULAR TENSION

Barkan, O. **Choice of operation in glaucoma.** Trans. Pacific Coast Oto-Ophth. Soc., 1939, 27th mtg., pp. 184-204.

The author discusses his method of studying the chamber angle gonioscopically with the idea that the angle pathology should determine the type of operation. He gives his opinions as to when to operate and the type of operation to employ.

Lawrence G. Dunlap.

Blanc, E. **Infiltration of the stellate ganglion in a case of acute glaucoma.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 66.

Report of a case of acute glaucoma with hemorrhage secondary to acute ocular traumatism. After two relapses it was successfully treated by one infiltration of the stellate ganglion with novocaine solution.

Jerome B. Thomas.

Dashevski, A. I. **The effect of darkness on the blind spot and on angioscotoma of the glaucomatous eye.** Viestnik Opht., 1940, v. 16, pt. 5, p. 351.

Studies on 92 glaucomatous eyes and on normal controls demonstrate that under the influence of darkness the blind spot and angioscotomata of glaucomatous eyes increase in size, while in normal eyes they remain unchanged.

Ray K. Daily.

Denig, Rudolf. **Iridotorsion: confirmation of its anatomic basis by Fortin's investigations on glaucoma.** Arch. of Ophth., 1940, v. 24, Sept., pp. 482-489.

The investigations of Fortin on the ciliary body and its related structures in their relation to glaucoma and its therapy are reviewed and the various operations for glaucoma discussed. The operative technique of iridotorsion is outlined and illustrated with drawings. The author feels that this operation is not only the most logical and anatomically correct but also the most reliable and safest operation for glaucoma.

J. Hewitt Judd.

Elwyn, Herman. **Calcified carotid artery with atrophy of the optic nerve, cupping and low tension.** Arch. of Ophth., 1940, v. 24, Sept., pp. 476-478. (See Section 11, Optic nerve and toxic amblyopias.)

Meyer, F. W. **Medical treatment of secondary hypertension in chronic intraocular inflammations.** Klin. M. f. Augenh., 1940, v. 104, June, p. 702.

From systematic investigations and detailed clinical histories, Meyer reaches the following conclusions as to the use of depressing pupillomotor drugs in chronic intraocular inflammation: Some cases of inflammatory secondary glaucoma show no response to medical treatment. Miotics effective in primary glaucoma frequently fail entirely in secondary glaucoma, or act

paradoxically. Mydriatics are usually more effective for lowering the pressure in inflamed eyes. Suprarenin is useful in cases of moderate hypertension, but fails in violent attacks. Levoglaucosan has proved to be most efficacious in secondary glaucoma, but it must be repeated if it does not act at once. It is especially valuable if atropine or scopolamine is not tolerated.

C. Zimmermann.

Myerson, A., and Thau, W. **Ocular pharmacology of furfuryl trimethyl ammonium iodide; with special reference to intraocular tension.** Arch. of Ophth., 1940, v. 24, Oct., pp. 758-760.

The effects of this drug were studied, first on animals and then on twenty subjects who were free from ocular disease. In the author's experience furfuryl trimethyl ammonium iodide has been shown to be a potent parasympathetic drug and especially effective in reducing intraocular tension. It seems, therefore, that this drug is worth a trial in the treatment of glaucoma. This preliminary work indicates that it is probably more effective than any of the drugs at present used and that it is entirely safe. J. Hewitt Judd.

Ohm, J. **The influence of intravenous injections of sodium salicylate in acute glaucoma.** Klin. M. f. Augenh., 1940, v. 104, June, p. 697.

Three cases of severe acute glaucoma are reported in which intravenous injection of 15 c.c. of sodium salicylate lowered the tension, so that operations could be performed under more favorable conditions. C. Zimmermann.

Pokrovskii, A. I. **External incision as the best method of approach to the angle of a shallow anterior chamber.** Viestnik Opht., 1940, v. 16, pt. 5, p. 295.

From an analysis of 162 cases, the majority of which were secondary glaucoma, the author urges a scleral incision with a scalpel as the safest approach to a shallow anterior chamber.

Ray K. Daily.

Preobraszenski, B. B. **Hereditary juvenile glaucoma.** Viestnik Opht., 1940, v. 16, pt. 5, p. 326.

A study of four generations, including 23 members, eleven of which had juvenile glaucoma. In this group there was no evidence of any anatomic anomalies, and the glaucoma was primary simple chronic in type with a shallow anterior chamber. None of the eyes was myopic. Inheritance was dominant and not sex-linked. Ray K. Daily.

Schmelzer, H. **Further metabolic investigations on glaucoma patients.** Klin. M. f. Augenh., 1940, v. 104, June, p. 722.

In his previous investigations on 55 glaucoma patients as compared with 45 healthy persons (Amer. Jour. Ophth., 1939, v. 22, p. 328), Schmelzer found in the great majority of the glaucoma patients intense hypercholesterinemia and positive xanthoprotein reaction. In further examinations of 23 glaucoma patients as compared with 25 controls, he encountered the same findings.

C. Zimmermann.

Stewart, Marshall. **A quick method for sharpening ocular trephines.** Arch. of Ophth., 1940, v. 24, Oct., pp. 797-798.

A mounted dental Arkansas stone is used in the rotary chuck of a dental engine to sharpen sclerocorneal trephines. The full amount of sharpening should be done on the outer beveled portion and the wire edge removed by a light reaming on the inside of the trephine. J. Hewitt Judd.

Thau, W., and Myerson, A. **Effect of iontophoresis on the eye; with special reference to intraocular tension.** Arch. of Ophth., 1940, v. 24, Oct., pp. 761-764.

Iontophoresis causes a general parasympathetic effect (slight narrowing of the palpebral fissure), miosis, some anterior projection of the lens, and a definite and prolonged lowering of the intraocular tension. These results were obtained consistently and repeatedly on four patients with tractable dementia praecox and are presented in an accompanying table. The effects last from six to nine days instead of a few hours. Repeated experiments on the same persons have shown no danger from this method, if care is taken that the electrode does not touch the cornea and is kept constantly moistened with salt solution. The effect may possibly be a stimulation of the ciliary muscle by the parasympathetic nerve and may be linked up with the increased blood flow, as evidenced by the dilatatiion of the capillaries, or may have reference to some more obscure chemical changes within the reacting cells themselves. It is likely that iontophoresis would produce a more marked reduction of tension in the glaucomatous than in the normal eye. J. Hewitt Judd.

Verhoeff, F. H., and Simpson, G. V. **Tubercle within central retinal vein: hemorrhagic glaucoma; retinal periphlebitis in other eye.** Arch. of Ophth., 1940, v. 24, Oct., pp. 645-655. (See Section 10, Retina and vitreous.)

Wiegersma, G. **Measuring the elasticity of the eye with the ballistic elastometer.** Klin. M. f. Augenh., 1940, v. 104, June, p. 688.

In addition to the study of intraocular tension, investigators of glaucoma and of the intraocular exchange of fluids emphasize the importance of examination of the elasticity of the eyeball. After discussing the various types of instruments, Wiegersma reports his investigations with the ballistometer (sclerometer) of Noyous on a phantom eye, and confirms his formerly expressed opinion that the elastic value of the eye depends exclusively on the intraocular pressure in relation to the cornea. C. Zimmermann.

9

CRYSTALLINE LENS

Bahr, Gunnor. **The influence of calcium deficiency on the rabbit lens in vitro.** Acta Ophth., 1940, v. 18, pt. 2, p. 170.

This laboratory investigation sought to discover the pathogenesis of tetany cataract. Isolated rabbit lenses kept in an artificial aqueous humor retained their transparency for several days; when the amount of calcium was reduced to half of the normal calcium content lenticular changes similar to those seen in tetany appeared. The same effect was produced by the addition of small amounts of digitonin to the artificial aqueous. Inasmuch as the extent of the lenticular changes bore no relation to the degree of hypocalcemia it does not appear probable that the hypocalcemia alone is sufficient to produce cataract. From a review of the literature the author concludes that a cataractogenous substance, the nature of which is as yet undetermined, is present in serum and in blood corpuscles; and that the hypocalcemia increases the permeability of the lens capsule and permits the entrance of this substance into the lens. The author believes that this substance may be a normal constituent of the aqueous humor. Ray K. Daily.

Basile, Giambattista. **The action of some products of hydrogenation of naphthalin (tetralin and decalin) on the lens and the deep ocular membranes of the rabbit.** Boll. d'Ocul., 1939, v. 18, Dec., pp. 951-957.

The tetralin and decalin administered per os to rabbits in small doses provoked in the course of a few days opacity of the cortical layers of the lenses at the equator, with a tendency to proceed toward the posterior layers. The drugs also provoked the formation in the fundus of some round gray spots which had a tendency to expand and fuse together, giving a diffuse turbid appearance to the retina.

M. Lombardo.

Bonnet, P., and Grandclément, E. **Three new cases of postoperative detachment of the choroid following total cataract extraction.** Bull. Soc. d'Opht. de Paris, 1939, Feb., p. 154.

Attention is directed to the use of transillumination in the diagnosis of choroidal detachment. It enables one to observe the detachment with extraordinary clearness. Jerome B. Thomas.

Fischer, F. P. **Formation of melanoidin in the lens.** Ophthalmologica, 1940, v. 100, Sept., p. 150.

The albuminoids become hydrolyzed readily and form compounds from which melanoidinic acids may be formed. The change takes place in the nucleus. These processes do not involve the glutathione which is of great importance for the continuation of the metabolism of the lens because of the detoxifying function of the process of melanoidin formation. The golden-yellow substance which had been found in the acetic-acid filtrate after precipitation with silver lactate in earlier investigations proved not to be a melanoidin. It is probably the cause of the yellowing of the ageing lens, while the melanoidines are the source of coloration of the nucleus. F. Herbert Haessler.

Genet, L. **Total extraction of the lens; comparison of results in the same patient previously operated on in the other eye by capsular incision.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 48.

Since 1933 the author has practiced total extractions, first in certain cases, then progressively in all cases of senile cataract and even in one case of zonular cataract. He presents twelve case histories and concludes that, although total extraction requires more time and more minute care on the part of the operator, the visual results are much superior. Jerome B. Thomas.

Holst, J. C. **Retinal detachment in aphakia.** Acta Ophth., 1940, v. 18, pt. 2, p. 204.

This is an analysis of twenty cases of retinal detachment in aphakic eyes, seen among 293 cases of retinal detachment in the Oslo eye clinic from 1932 to 1939. Of the twenty patients five were myopes. Four of the eyes had had intracapsular, and 16 capsulotomy extractions. Of the 16 eyes operated upon extracapsularly, there were only four in which the retinal detachment was not preceded by other complications. Of the four intracapsular cases there was only one in which the detachment was clearly attributable to the extraction. Retinal tears were found in 14 cases. Sixteen patients were operated upon with five recoveries. Two additional cases had primary reattachment, with a recurrence several months later. None of the intracapsularly operated cases were cured; in one a primary reattachment was followed by recurrence a few months later.

Ray K. Daily.

Jensen, C. D. F. **Sympathetic ophthalmia following cataract surgery.** Trans. Pacific Coast Oto-Ophth. Soc., 1939, 27th mtg., pp. 238-244. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Kilgore, G. L. **Arachnodactyly (Marfan's syndrome) and its eye complications.** Trans. Pacific Coast Oto-Ophth. Soc., 1939, 27th mtg., pp. 223-229.

Three sisters in a family of five presented the pathologic changes of arachnodactyly. One, aged 33 years, had a shallow coloboma in each lens below. The second, aged 32 years, had the same condition with loss of vision of the right eye following injury to the right side of the head. The left eye showed a shallow coloboma below with 6/6 vision with myopic correction. The third, aged 27 years, with poor vision in each eye since birth, had a subluxated lens. At nine years of age an attempted needling had luxated the right lens into the vitreous and later into the anterior chamber after which glaucoma had developed and the eye had become blind. The left eye had vision of 3/200 with iridodonesis and the lens luxated up and out. A very minor blow or injury to the face or eye may luxate the lens or cause a retinal detachment. Lawrence G. Dunlap.

Meding, C. B. **After half a century of cataract extraction.** Arch. of Ophth., 1940, v. 24, Oct., pp. 627-644.

This résumé of the fundamentals of cataract extraction includes a discussion of anesthesia, set-up, technique, bandage, and hospitalization. The author finds that most errors and failures in cataract extraction result from lack of a workable diagnosis, insufficient anesthesia, poor sight and facility, poor or badly selected tools and light, the wrong method, poor bandage and aftercare, and insufficient practice.

J. Hewitt Judd.

Nastri, Francesco. **Late researches on hypovitaminosis C in patients affected by cataract.** Boll. d'Ocul., 1939, v. 18, Dec., pp. 965-977.

Researches made on the elimination of ascorbic acid in the urine of patients affected by cataract showed that in about 50 percent of the cases a marked hypovitaminosis-C existed. Since the same condition exists in patients not affected by cataract, the writer concludes that no causal relation exists between senile cataract and this type of hypovitaminosis. (Bibliography.)

M. Lombardo.

Sourdille, G. P., Duval, E., and Gendron. **Congenital cataract and oxycephaly.** Bull. Soc. d'Opht. de Paris, 1939, March, p. 186.

The number of congenital cataracts associated with oxycephaly is rare. The authors report two cases. In the first case there existed zonular cataracts, oxycephaly, and arachnodactyly, but no lesion of the optic nerves in spite of the radiogram typical of cranial hypertension. In the second case the cataract was accompanied only by an isolated oxycephaly, but there was edema of the optic nerve. The need for treating the optic lesion before the stage of atrophy requires its early discovery. Early treatment of the cataracts, behind which a papillary stasis or perhaps beginning atrophy may be hidden, is therefore indispensable. (4 radiograms.)

Jerome B. Thomas.

Stone, L. S., and Dinnean, F. L. **Origin of the lens by induction in the salamander Amblyostoma punctatum.** Proc. Soc. Exper. Biol. and Med., 1940, v. 45, Oct., p. 183.

In the embryonic salamander, the presumptive lens-forming region was completely excised and replaced by ectoderm taken from the ventral pole, the new ectoderm having previously been dyed blue. The blue ectoderm later covered the entire side of the head including the eye. In the ocular area the grafted ectoderm developed into a lens. In histologic sections the lens contained the blue dye, leaving no doubt as to its origin. In some cases no eyes were formed and when this occurred there were no lenses. This indicates that the fiber-forming pole of the lens (the center for lens formation) is likely a direct product of the inducing eye-center.

Morris Kaplan.

Tum Suden, C., and Wyman, L. C. **Adrenalin-induced opacities of the lens in the rat.** Endocrinology, 1940, v. 27, Oct., p. 628.

Adrenalin intoxication did not induce temporary loss of transparency of the lens in vigorous, normal rats; but during histamine shock, potassium poisoning, or cortico-adrenal insufficiency, the modified adrenalin reaction produced opacification of the lens similar to that previously reported for mice. The process of opacification depends upon the presence of conditions favoring circulatory collapse associated with carbohydrate disturbances.

Edna M. Reynolds.

10

RETINA AND VITREOUS

Anglani, Alceste. **Contribution to the knowledge and treatment of retinal detachment with cystic formations.** Boll. d'Ocul., 1939, v. 18, Dec., pp. 923-934.

A man of 35 years with a myopia of 5.00 D. in each eye showed a flat retinal detachment in the lower temporal segment of the right eye. Within the same area was a globular transparent grayish-red body, with four round retinal tears that seemed to be ruptured cysts. Episcleral diathermy coagulation led to recovery which persisted when the eye was examined again seven months later. At the original site of the detachment, spots of chorioretinitis were seen but none of the cysts. The writer discusses a possible pathogenetic relation between cysts and retinal detachment, and hints at the possibility that in his case the retinal detachment had originated with rupture of the cysts. (Bibliography, 2 colored figures.)

M. Lombardo.

Bailliart, P., Schiff-Wertheimer, and Juvanon, L. **Formation of aneurysmal dilatations of the retinal arteries in a case of hypertension.** Bull. Soc. d'Opht. de Paris, 1939, March, p. 164.

The lesions are characterized by the appearance of localized narrowing of certain retinal arterioles below which the vessel, while normal in appearance, shows itself in reality dilated and pulsates when the globe is submitted to sufficient pressure. Successive obervations of this case seem to indicate that in a diseased arteriole the circulatory disturbance caused by partial obstruction of an arterial segment is a factor in the formation of the aneurysmal dilatation. The latter occurs as if the changed arterial wall became forced by pressure at one point, this pressure causing in its turn an aggravation of the necrosis of the arterial walls. (2 fundus photographs.)

Jerome B. Thomas.

Basile, Giambattista. **The action of some products of hydrogenation of naphthalin (tetralin and decalin) on**

the lens and the deep ocular membranes of the rabbit. Boll. d'Ocul., 1939, v. 18, Dec., pp. 951-957. (See Section 9, Crystalline lens.)

Bogoslovski, A. I., and Rosenblum, M. E. **Electric sensitivity in retinal detachment.** Viestnik Opht., 1940, v. 16, pt. 5, p. 316.

The electric sensitivity in dark and light adaptation was tested in 22 patients with retinal detachment; postoperative tests were made on twelve cases treated by electrocoagulation, seven of which were cured. The data show a diminished response, remaining on one level, unaltered by dark or light adaptation. In cases cured by operation the sensitivity and its physiologic variations returned and approached normal. This investigation indicates that the primary impulse initiated by electric stimulation originates in the retina and not in the optic nerve. Ray K. Daily.

Bonnet, P. **Angiomatosis of the retina.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 56.

Report of a case of retinal angiomatosis of several years standing in a man 44 years old. Jerome B. Thomas.

Bonnet, P. **Recurrent hemorrhage of the vitreous in a woman.** Bull. Soc. d'Opht. de Paris, 1939, Feb., p. 140.

The patient, a woman of 37 years, gave a history of numerous attacks of vitreous hemorrhage, the first of which occurred at puberty, a few days before the first appearance of the menses. The following etiologic factors were associated in this case: (1) tuberculosis; (2) syphilis, with positive Bordet-Wassermann; (3) focal infection, dental; (4) endocrine disturbance, especially ovarian. Jerome B. Thomas.

Chand, Ratan. **Night blindness in Hissar.** Indian Med. Jour., 1940, v. 34, May, p. 121.

The outcome of 317 cases of night blindness treated with cod-liver oil (1 ounce daily to adults and proportionately smaller doses for children) is reported. The number of cures ranged from 20 percent in cases lasting a year to 82.5 percent in cases of from one to ten days duration. Edna M. Reynolds.

Fanta, H. **Detachment of the retina and accident.** Klin. M. f. Augenh., 1940, v. 105, July, p. 30.

Fanta distinguishes between direct and indirect traumatism, although he believes that most traumatisms act through the same factor, violent and sudden rotation of the eye. He collected the clinical histories of 595 retinal-detachment cases admitted to the Clinic of Vienna during the last ten years. In one hundred eyes the detachments were probably due to trauma; 9 percent perforating, 46 percent direct, 38 percent indirect, and 6 percent resulting from general overexertion.

C. Zimmermann.

Galeazzi, Cesare. **Bilateral, symmetric, paramacular chorioretinal hereditary degeneration of familial type.** Boll. d'Ocul., 1939, v. 18, Dec., pp. 935-950.

The condition, transmitted from the father to four of his five children, appeared as a yellowish-white spot measuring three by four disc diameters, with its greater diameter vertical, and surrounded by abundant pigment so disposed as to form figures similar to bone corpuscles. Some of the retinal blood vessels passed over the spot. The vision ranged from 0.1 to 0.5 in one or both eyes in the different subjects. (Bibliography, figures.) M. Lombardo.

Hessberg, R. **Roentgen therapy of diseases of the retinal vessels, particularly venous thrombosis.** Ophthalmologica, 1940, v. 100, nos. 1 and 2, June-July, p. 74.

The author has been systematically treating diseases of the retinal vessels with roentgen rays since 1919. He now evaluates this therapy on the basis of his own experience and that reported in the literature.

Hemorrhagic and absolute glaucoma are the most dangerous complications of thrombosis of retinal veins. They occur more often when the central vein rather than a branch is the seat of the thrombosis. When the trunk is involved, prognosis is very bad. Without roentgen therapy, most of the eyes so afflicted must be enucleated. Surgical therapy is usually only transiently helpful. After roentgen therapy the pain disappears and often the hemorrhage becomes absorbed. Deeply penetrating rays are used in doses of 100 r. at the first treatment and 50 r. every five to ten days until the eye is well. When a branch is involved, about one half of this dose is indicated. The roentgen rays influence the sympathetic nerve endings and secondarily the vascular system. Small stimulating doses produce vasodilation and hasten absorption. Larger doses bring about vasoconstriction and finally obliteration in the latest stage. Treatment should be begun early. Hessberg advises roentgen therapy for hemorrhages which are not a result of thrombosis only when they are severe and follow accidental or surgical trauma, and when other therapy has been tried without avail. In juvenile retinal and vitreous hemorrhage this form of therapy is not recommended.

F. Herbert Haessler.

Holst, J. C. **Retinal detachment in aphakia.** Acta Ophth., 1940, v. 18, pt. 2, p. 204. (See Section 9, Crystalline lens.)

Holst, J. C. **Traumatic retinal detachment.** Acta Ophth., 1940, v. 18, pt. 2, p. 190.

In 49 of 283 eyes with retinal detachment there was a history of preceding injury. In 9 there had been a perforating injury, in 24 a blunt blow on the eyeball, and in 16 an indirect injury to the head or orbital rim. Of the detachments with perforating injuries 2 were cured surgically. Of the 24 cases caused by blunt ocular traumatism, 19 were operated upon and 9 cured. All 16 cases following indirect injury were operated upon and 8 were cured; in this group were 9 cases of detachment at the ora serrata of which 6 were cured. From the analysis of this material the author concludes that following perforating injuries retinal detachment may occur in previously healthy eyes; the detachment may be immediate, or late by cicatricial contraction. Direct blunt injuries may also cause retinal detachment in healthy eyes; in such cases the detachment is usually immediate, although occasionally there may be a latent period between the injury and the detachment. Indirect trauma is rarely the cause of detachment except in eyes predisposed through myopia or senile degeneration; in such cases the detachment is an immediate consequence of the injury. Ray K. Daily.

Hudelo, André. **Spasm of the trunk of the central artery of the retina.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 14.

The case report is of special interest on account of (1) the special localization of the spasm in the retrobulbar portion of the artery, (2) the special ophthalmoscopic appearance of the retinal arteries, (3) the opportunity to

follow almost from minute to minute the changes of the eyeground, (4) the aspect, after eight days, of lesions which are usually regarded as old, and (5) the similarity between ocular and encephalic disturbances.

Regarding the appearance of pigment following retinal ischemia, how can one account for the disturbance of the pigmentary epithelium? The vascular changes were localized in the retinal network of vessels, that is to say a network which does not supply the external layers of the retina. In spite of that fact they induced a deep alteration of the pigment situated on a more external plane. It seems that, in case of degeneration of certain neighboring elements which sustain the retina, the pigment, affected by a defensive tropism, accumulates in the empty spaces. Particularly instructive is the pigmentary chorioretinitis, old in appearance but recent nevertheless. Often one bases an etiologic theory on the discovery of peripheral lesions apparently of long standing. The observation of this case proves that such lesions may have occurred within eight days.

Jerome B. Thomas.

Isaacs, B. L., Jung, F. T., and Ivy, A. C. **Clinical studies of vitamin-A deficiency.** Arch. of Ophth., 1940, v. 24, Oct., pp. 698-721.

The adaptometer as designed by Hecht has been found to be more reliable for the determination of visual dark-adaptation thresholds than the biophotometer. Relatively large daily doses of liquid petrolatum for periods up to 131 days failed to produce recognizable vitamin-A deficiency or other unfavorable effects in 28 normal young adults. These subjects were compared during the same period with 29 normal young adults who did not receive the liquid petrolatum. A diet containing an average of 74 U.S.P. units of vitamin A daily failed to produce definite measurable visual evidence or subjective signs of deficiency in three subjects maintained on the diet for 43 to 49 days. Temporary subjective clinical evidence of deficiency was reported by two of these. Normal subjects showed the same trend toward increased dark-threshold levels between September and December as was manifested by the subjects on the controlled deficiency diet. The possible explanation for this is discussed. Measurements of vision, size and shape of the blind spot, and visual fields failed to indicate consistent significant changes which could be attributed to vitamin-A deficiency or to high vitamin-A therapy. Doses of 300,000 units of vitamin A daily for as long as four months failed to show evidence of harmful effects in the three experimental subjects on the deficient-diet regimen. In ten patients suspected of having vitamin-A deficiency, the same dose occasionally failed to improve the dark thresholds.

J. Hewitt Judd.

Kyrieleis, W. **In doubtful cases can the existence of night blindness be proved with certainty?** Klin. M. f. Augenh., 1940, v. 104, June, p. 663.

A common defect of examinations for dark adaptation is that they are confined to the subjective statements of the patient. It is important to find a procedure by which disturbance of adaptation can be satisfactorily proved. The author found in his tests under different conditions that the course of adaptation and its demonstration by the curve of adaptation presented a far-reaching individual constancy, which under equal conditions always took an equal course peculiar to the examined

person. Errors from the method can be avoided if the records of time and threshold values are automatically ascertained. Hence it is difficult and impossible for a malingerer at a repetition of the test under equal conditions to consciously make exactly the same errors. If at repetition the curve shows a complete equality in both tests a disturbance of adaptation is proved. A good adaptometer is essential and an appliance for automatic recording desirable. C. Zimmermann.

McDonald, R., and Adler, F. H. **Clinical evaluation of tests of dark adaptation.** Arch. of Ophth., 1940, v. 24, Sept., pp. 447-461.

Dark-adaptation tests were conducted with the adaptometer of Hecht and Shlaer on a number of patients with various ocular diseases and a similar group of patients whose eyes were apparently normal, but who were hospitalized for ailments in which a vitamin-A deficiency might be expected. In the first group two cases with impaired transparency of the ocular media, five cases of retinal degeneration, one case of refractive error, and three cases with visual-field defects are reported to show that only after consideration of each of these factors can the test be considered of value. If the dark-adaptation tests show a definitely abnormal threshold, it is necessary to consider whether the patient is a poor observer, either from inexperience or lack of intelligence. However, if the subject is a good observer and the eye is apparently healthy, there must be some defect in the retina or conducting fibers which present methods of examination fail to reveal, or the retina is deficient in vitamin A. This, in turn, suggests a deficiency of the whole body in vitamin A, but such conclusions can only be considered presumptive until some correlation has been made between the vitamin-A content of the blood and the deficient dark-adaptation threshold. The authors point out that contrary to previous statements, it is not possible to reduce the threshold rapidly by the administration of large amounts of vitamin A. J. Hewitt Judd.

McKeown, H. S. **Detachment of the retina.** Arch. Physical Therapy, 1940, v. 21, Aug., p. 489.

The author analyzed 506 unselected cases operated upon at the Institute of Ophthalmology of Presbyterian Hospital. There was a history of trauma in 13 percent of the cases. Myopia was present in 61.5 percent and amounted to 6 D. or over in 35 percent. Rectus muscles were tenotomized routinely and reattached at the completion of the operation. No annoying postoperative diplopia resulted from this procedure, and muscle balance was not impaired. Lowered intraocular tension was a grave prognostic sign, the retina being reattached in only three cases out of 33, functional vision returning in none.

Cases were classified as cured, improved, and unimproved. The eye was considered cured when the retina was completely reattached, the visual field enlarged, and functional vision obtained. Improved cases were those in which the retina appeared to be in normal position, the visual field enlarged, but in which functional vision was not obtained. In the entire series 45.2 percent were cured and 9.3 percent improved. Surgical results were better when retinal holes were found and closed. The author agrees with Reese that the poor central vision frequently encountered after retinal-detachment operations is due either to a pre-existing macular degeneration or to degen-

eration occurring after the onset of the detachment. (5 references, discussion.)
Ralph W. Danielson.

Moura Compos, de. **Vitamins and visual purple.** Folio Clin. et Biol., 1940, v. 12, no. 4, p. 131.

The article is a good review of our knowledge of the effects of avitaminosis A upon visual acuity. The author begins with the earliest known historical uses of vitamins for night blindness and cites interesting reports up to the present time. Eugene B. Blake.

Müller, H. V., Schultz, H. J., and Lautsch, J., **The standardization of the dark-adaptation test.** Klin. M. f. Augenh., 1940, v. 104, June, p. 649.

At the eye clinic of the University of Berlin an attempt was made to devise a method of testing dark adaptation so as to insure comparable results by different examiners at different places. A standard curve deviating somewhat from the well-known curve of Matthey is given for the examinations in Germany. C. Zimmermann.

O'Brien, C. S., and Allen, J. H. **Unusual changes in the retinal veins in diabetes.** Arch. of Ophth., 1940, v. 24, Oct., pp. 742-757.

Varices of the retina are uncommon but are seen occasionally in patients with the retinitis of diabetes and more rarely in those with arteriosclerotic retinitis. The findings in 21 cases of diabetes with retinitis and retinal varices are reported and summarized. In addition to the typical findings of diabetic retinitis with its commonly associated arteriosclerotic changes, the veins show irregular, localized varicosities. Microscopically, the veins appear sclerosed, the walls showing variation in thickness, hyaline degeneration, endothelial proliferation, and thromboses. The changes are shown in fundus drawings and photomicrographs. (Discussion.)
J. Hewitt Judd.

Rollin, A. **Instability of retinal arterial tension, of carotid-sinus origin.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 10.

The author presents a clinical case report illustrating the role of the carotid sinus in variations of retinal tension. Jerome B. Thomas.

Schiff-Wertheimer, S., and Galan, R. **Cleavage of the retina and lesions of the veins.** Bull. Soc. d'Opht. de Paris, 1939, Jan., p. 21.

The author proposed to treat this patient by diathermy coagulation, with the object of walling off the hemorrhagic zones from the healthy retina and of creating a scarred area in the territories of the altered veins. In cases of this sort it is considered prudent to limit the action of diathermy coagulation, and to allow an interval of several weeks between treatments of the different areas. (2 fundus photographs.)
Jerome B. Thomas.

NEWS ITEMS

Edited by H. Rommel Hildreth, 640 S. Kingshighway, Saint Louis

News items should reach the Editor-in-Chief by the twelfth of the month

Deaths

Dr. Emory Hill, Richmond, Virginia, died December 4, 1940, aged 57 years.

Dr. Joseph Madison Daly, Abilene, Texas, died January 6, 1941, aged 68 years.

Dr. Frank Newton Irwin, White Plains, New York, died November 11, 1940, aged 75 years.

Dr. Edwin Charles Ebert, Long Beach, California, died November 4, 1940, aged 50 years.

Dr. Leonard Knight Graves, Elmhurst, New York, died November 12, 1940, aged 84 years.

Dr. Clark Wilder Hawley, Chicago, Illinois, died November 1, 1940, aged 85 years.

Dr. Louis Charles Deane, San Francisco, California, died October 17, 1940, aged 69 years.

Dr. Frederick William Bailey, Manhasset, New York, died October 11, 1940, aged 62 years.

Dr. William Johnstone Thomson, Broadmoor, Colorado, died October 14, 1940, aged 66 years.

Dr. William James Jolly, Oklahoma City, Oklahoma, died September 24, 1940, aged 91 years.

Dr. George Robert Cruickshank, Windsor, Ontario, died October 8, 1940, aged 80 years.

Dr. Francis William Briggs, Havre, Montana, died October 27, 1940, aged 66 years.

Dr. George J. Hess, Wayne, Nebraska, died October 25, 1940, aged 72 years.

Dr. Walter Wesley Sawyer, Elizabeth City, North Carolina, died October 20, 1940, aged 60 years.

Dr. Lawrence Henry Oliver, Waupun, Wisconsin, died October 30, 1940, aged 54 years.

Dr. George William May, Manchester, Connecticut, died October 23, 1940, aged 80 years.

Dr. James Andrew Brown, San Diego, California, died November 16, 1940, aged 47 years.

Dr. Robert James Baird, Creston, Ohio, died November 3, 1940, aged 87 years.

Dr. William Marshall Hinkle, Philadelphia, Pennsylvania, died November 21, 1940, aged 77 years.

Dr. William Edward Owen, Cedar Rapids, Iowa, died November 9, 1940, aged 78 years.

Miscellaneous

The Gill Memorial Eye, Ear, and Throat Hospital announces its fifteenth annual Spring Graduate Course from April 7 to 12, 1941. Information can be obtained from the Superintendent, Gill Memorial Eye, Ear, and Throat Hospital, Box 2467, Roanoke, Virginia.

The George Washington University School of Medicine, 1335 H Street N.W., Washington, D.C., announces its second annual Post-Graduate Course in Aviation Medicine, including aviation ophthalmology for graduates in medicine. The guest lecturers are leaders in this specialty in the Army, the Navy, the Civil Aeronautics Board, and include medical directors of several important commercial air-lines as well as civilian physicians interested in the subject. February 3 to 7, 1941.

The fifth annual intensive Post-Graduate Course in Ophthalmology of the George Washington University School of Medicine will be held from April 7 to 12, 1941. Dr. William Thornwall Davis is the executive officer.

Directly following the intensive course there will be a practical course in ocular surgery, pathology, and orthoptics from April 14 to 19, 1941. This course is limited to 25 participants. The course in ocular pathology will be given at the Army Medical Museum. The course in surgery and orthoptics will be given at the School of Medicine, 1335 H Street N.W., Washington, D.C.

The American Board of Ophthalmology announces the written examinations, March 8, 1941, in various cities throughout the country. This will be the only written examination in 1941. All applicants must pass satisfactory written examinations before being admitted to the clinical examinations. The clinical examinations will be held at San Francisco in August; at Cleveland and Chicago in October. Definite dates will be announced later. For information write at once to Dr. John Green, 6830 Waterman Avenue, Saint Louis, Missouri.

Societies

On Monday, April 7th, the Washington, D.C., Ophthalmological Society will present a program consisting of guest speakers. These are: Dr. James H. Allen, Iowa City, who will speak on "Recent developments in the treatment of conjunctivitis"; Dr. James Watson White, New York City, on "Squints in life, literature, and art"; Dr. T. L. Terry, Boston, on "Some important factors in diagnosis and treatment of uveal malignant melanoma"; and Dr. F. Bruce Fralick, Ann Arbor, on "Iridocyclitic secondary glaucoma."

At a meeting of the Milwaukee Oto-Ophthalmic Society on January 16, Dr. Hedwig Kuhn discussed "Visual testing in indus-

try." Dr. John B. Hitz is president; Dr. Ralph T. Rank is secretary.

At the third annual congress on industrial health sponsored by the Council on Industrial Health, American Medical Association, January 13 and 14, 1941, Dr. Leonard Greenburg, New York City, spoke on "Economic importance of visual disability in industry"; Dr. Sydney Walker, Jr., and Dr. Hanford L. Auten, Chicago, discussed "Essentials of first aid and later management of industrial eye injuries"; Dr. Arthur M. Culler, Dayton, spoke on "Detection and control of defective vision in industry"; Dr. Thomas D. Allen, Chicago, and Dr. Henry F. Carman, San Francisco, discussed "Protective equipment for eyes in industry."

At the meeting of the American Academy of Ophthalmology and Otolaryngology in Cleveland, October 8, 1940, the Brooklyn Eye and Ear Alumni Association was formally organized. An annual meeting and dinner will henceforth be held at the time of each Academy meeting. Thirty-eight attended the organizing dinner. Dr. C. Dwight Townes, Louisville, acted as toastmaster. Dr. John Evans showed a motion-picture film of the old and new Brooklyn Eye and Ear Hospitals. Dr. Leo J. Croll, of Detroit, was elected chairman and Dr. Ernest Sheppard of Washington, D.C., vice-chairman.

Mr. Mason H. Bigelow of New York City was elected president of the National Society for the Prevention of Blindness on the occasion of the Society's annual meeting in New York, Thursday, December 12. William Fellowes Morgan, the retiring president, after 25 years of service, was made president-emeritus. Mr. Bigelow graduated from Amherst in 1909 and from Columbia University Law School in 1912. He has been a member of the board of directors and executive committee of the National Society for the Prevention of Blindness for the past six years. Dr. Edward C. Ellett of Memphis, Tennessee, was elected a vice-president to fill the vacancy left by the recent death of Dr. Park Lewis of Buffalo. The society has approximately 17,500 members and donors throughout the United States. It spent $159,000 during the past year and a budget of $167,500 was authorized by the board of directors for 1941. Headquarters are maintained at 1790 Broadway, New York City. Mrs. Eleanor Brown Merrill is executive director.

Personals

Dr. Arthur C. Chandler announces the opening of his offices at 510 Medical Arts Building, Charleston, West Virginia.